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No 7, July 1985

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INFORMATION, EVENTS, FACTS

FOREIGN MILITARY AFFAIRS

REVIEW OF U.S. CAPABILITIES, POLICY, PLANS IN INDIAN OCEAN REGION

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 3-10

[Article by Col F. Nikolaev; "The Indian Ocean: A Zone of Peace or the USA's Third Strategic Zone?"]

[Text] In recent times, the Indian Ocean has attracted more and more attention from the Pentagon. The growing U.S. military expansion in that region is a reality which creates a serious threat to the national security of many states, both those along the coast and others far from the ocean. Just what are the essence, concrete manifestations and consequences of Washington's military preparedness in this region?

U.S. STRATEGIC MILITARY INTERESTS. One of the chief determining factors of American imperialism's interests and goals in the Indian Ocean zone is the vast reserves of a variety of raw materials, primarily oil. In the Persian Gulf alone these reserves are estimated at 50 billion tons, which is approximately 70 per cent of the world's explored reserves (excluding those of the socialist states). The oil extracted here supplies 60 per cent of the West's needs. The oil and petroleum products of the region's countries are used by American forces stationed in Western Europe, as well as in the basins of the Mediterranean Sea, the Indian and Pacific Oceans.

The importance of this basin to world shipping is unusually great. Nearly one fourth of all the world's shipping and almost two thirds of its oil passes through the ports of the coastal states. The significance of the straits is great: up to 140 ships pass through the Strait of Malacca every day, about 100 through the Strait of Hormuz, and several dozens through the Bab el Mandeb.

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The region's economic and political significance stems also from the presence of very densely populated developing countries. In just 36 of the region's

states, there is almost one third of the globe's population. They comprise almost one quarter of the U.N.'s members, actively participate in the non-aligned movement, and are an influential force in the zones of Asia's and Africa's national liberation movement. For this very reason, the slowing down, and ultimately the liquidation, of the progressive tendencies in the political, economic and social development of the region's countries is one of the goals of the U.S. military presence there.

In strategic military terms, the Indian Ocean, located near the southern border of the Soviet Union, presents a convenient springboard for the U.S. to deploy various types of weapons aimed at the USSR.

Taken together, all these enumerated factors determine both the strategic and tactical aspects of Washington's policy. It was formulated in a concentrated form in the so-called "Carter Doctrine." Speaking before the Congress on January 23, 1980, President Carter announced that the Persian Gulf region was a "zone of vital interest" to the U.S. and stated that it would "defend" that region "by all necessary means," including military force.

In addition, a Pentagon document, "Directives in the Area of Defense for Fiscal Years 1984-1988 reads, "The U.S. strategy in Southeast Asia, including the Persian Gulf, calls for the readiness of American military forces to pave the way, if necessary, without waiting for an invitation on the part of a friendly country." Under the guise of repulsing a fictional "Soviet threat," the document also enunciates the "right" of the American military clique to invade the territory of a friendly territory without warning.

But what then awaits those states of the region which do not appear on the roster of "friendlies?" Is this not a declaration of "law of the jungle" in an official Pentagon document, and Washington, as the world community has long believed, thinks that international law does not apply to it, that it can disregard it on matters concerning the egotistical interests of the American ruling circles.

It must be added that during the Reagan administration, the "Carter Doctrine" was supplemented by such a dangerous makeweight as the possibility of a "limited" nuclear war in the Indian Ocean region. The U.S. would like to kill two birds with one stone in the course of this action: to implement its aggressive plans within the framework of the strategy of "direct hostilities" between the U.S. and USSR, as well as to avoid a crushing counter strike on the part of the Soviet Union.

THE MECHANISM, FORCES AND MEANS OF MILITARY EXPANSION. The above-mentioned conceptual constructs are being realized by the United States in the following directions: strengthening of its military potential intended for aggressive actions against the region's states: modernization of the existing military bases and an intensive search for new ones both in the Indian Ocean zone and in neighboring regions which would provide optional conditions for a long-term presence and autonomous actions by the Rapid Deployment Force (RDF) and by certain elements of the strategic offensive forces; a significant expansion in military deliveries to a number of the region's reactionary regimes, including those for subsequent supplying of bandits infiltrated into Afghanistan;

development of tactics for actions and the playing out of various scenarios for use of the RDF within the framework of the U.S. Central Military Command (CENTCOM)[1] which began to operate in January, 1983; and conducting of a large-scale psychological war against the peoples of the region's countries. We will look further into several of these aims.

The reinforcement of U.S. military potential in the zone is taking place due primarily to an unprecedented strengthening of its naval power. The chronology of events is as follows. Immediately after the end of the Second World War, a permanent naval operational unit (the U.S. Naval Command in the Middle East, subordinate to the U.S. Naval Command in Europe) was formed in the Persian Gulf comprising a flagship and two destroyers or frigates. In the early 1970's, the American ships were involved mainly in transitting the Indian Ocean, limiting themselves to visiting the ports of coastal states. Since 1973 (after the fourth Arab-Israel War), American aircraft carriers have appeared more frequently, and operational units of cruisers and destroyers have been a permanent presence.

After the anti-Shah revolution in Iran, which seriously upset the U.S.'s position in the region, the number of American ships in the Indian Ocean has increased sharply. In the first half of 1980, the Pentagon simultaneously dispatched four aircraft carriers accompanied by cruisers, destroyers, and frigates (about 30 ships in all). In the same year, two carrier strike groups and a group of amphibious craft, including helicopter carriers, appeared continuously off the coast of Iran. It was precisely from the early 1980s that the Indian Ocean was directly referred to in official U.S. documents as an "extended operational area for future use of the American SSBNs. At present, a large U.S. naval grouping is deployed there. Its backbone is one or two carrier groups (up to 20 combat ships) from the Sixth and Seventh Operational Fleets. Up to 180 combat aircraft are based on the carriers, which includes 80 nuclear-capable attack aircraft.

In one of its reports before Congress in 1982, the Reagan administration bluntly announced that the deployment of American submarines significantly complicates the Soviet Union's defense problem. With that, it was cynically added that "any serious consideration of the concept of peace in the Indian Ocean must take these potential opportunities into consideration."

In order to provide reliable control of the Navy in the Indian Ocean and other regions of the world ocean separated from the U.S., the United States is carrying out a program to create a new communications system using satellites. The program envisages the placing of additional observation and communication satellites in a stationary orbit above the Indian Ocean. Plans call for outfitting them with devices to protect against the electromagnetic radiation of nuclear blasts. According to foreign press reports, the Pentagon has already created in this zone a modern command system using space communications stations located in the center of Australia (Pine Gap, Bumera, and Alice Springs), as well as in Northeast Cape at the easternmost point of Austrilia's Indian Ocean coast.

The missile capability of the submarines patrolling the Indian Ocean is augmented by U.S. strategic bombers which make regular flights in the region,

and heighten the American threat not only on a regional but also on a global scale. In the early 1980s, cruise missiles, in particular the sea-based TOMAHAWK with a 2,500 km range, became a serious supplement to the U.S. naval buildup.

And that is still not all. According to information in the American press, the Pentagon is reviewing a variety of options which envision the creation of a Fifth Fleet permanently stationed in the Indian Ocean or the reassignment of a large part of the Seventh Fleet's forces to that region. In the latter instance, there is a proposal to form still another fleet in the Pacific Ocean.

Thus, the buildup of the American military potential in the Indian Ocean zone is at hand, creating a direct threat to both the coastal states and the Soviet Union and the cause of peace throughout the world.

U.S. MILITARY BASES. Within the framework of strengthening its naval and air power in the Indian Ocean, the United States is expanding its network of military bases and strongholds there for servicing a growing number of ships and aircraft, as well as for stationing of the RDF.

Diego Garcia is considered the main U.S. base in the region.[2]. Construction began in 1971. Later on, they built piers for all classes of ships, an airfield with a 3,680-m runway, put into operation a center for communications, radio and electronic reconnaissance, and build supply depots for ammunition and fuel. The specially dredged lagoon and the docks can accommodate a carrier group. According to foreign press reports, work continues to create the opportunity for the permanent basing of nuclear submarines on the island.

Up to nine supply ships with heavy armaments and enough supplies for thirty days of combat operations by a marine expeditionary brigade are stationed at Diego Garcia for the purpose of shortening the deployment times of groupings of military forces in action in the Indian Ocean zone. Late in 1984, the American press published reports of plans to replace them with more modern ships of a new design, with up to 50,000 tons displacement, which would permit storage of a much larger amount of weapons, military equipment and other materiel. It is anticipated that all the ships and supply ships at Diego Garcia will be replaced as early as 1985. Plans call for the deployment of supply ships in the Eastern Atlantic in the same year. And still another group of such ships will be stationed in the Pacific Ocean.

The Pentagon does not hide the chief purpose of the measures it has undertaken in this area--the improvement of rear supply for combat operations by the interventionist RDF. In Pentagon strategists' opinion, this would increase the flexibility of the RDF subunits and units, present the opportunity to airlift them "unencumbered" from one region to another, to quickly supply them with heavy equipment and armaments from supply ships, and to drop them into their next adventures.

Thus, the transformation of Diego Garcia into a center for U.S. military preparations in the Indian Ocean zone is an important element of not only the regional, but also the global, military activity of the U.S.

In connection with the events in Iran, those surrounding Afghanistan and the Iran-Iraq War, the Pentagon has, in recent years been striving to secure for itself new bases in the northwest sector of the Indian Ocean. Through promises of significant amounts of military aid and back-room political intrigues, the United States managed to effect the signing of an agreement with Oman, Kenya and Somalia in 1980, allowing the Pentagon to use these states' national naval and air bases.

In the U.S.-Oman agreement, the Pentagon gained access to three air bases in Oman. A similar U.S. agreement bound Kenya, which gave up three military airfields and one port at its disposal. The agreement with Magadishu envisioned the Pentagon's use of the Somali port of Berber, which has been transformed, in essence, into an American military base, and one airbase. As the Western press candidly stated, the bases in Somalia would be used for naval reconnaissance, refueling of aircraft and ships, and the timely distribution and storage of military equipment.

It has also been proposed to use these sites for the material and technical servicing of the American Navy and Air Force, equally with RDF, in the event that they carry out operations in the regions of the Gulf of Aden and the Red Sea. The corresponding scenarios are worked out in exercises devised by CENTCOM.

The administration in Washington plans to expend 1.5 billion dollars on military construction projects in the region between 1983-1987 alone.

Despite the fact that Saudi Arabia refused to sign the same type of agreement, the U.S. Air Force, according to foreign press reports, gained ready access to one of its air bases and will periodically make use of others. The pentagon also has these military privileges in Egypt and yet another series of countries. The agreement on "strategic cooperation" with Israel gave the American military the right to use the bases of that country.

In Southern Asia, the United States has vitually gained access to Pakistan's military bases. The Indian press pointed out that the following secret agreement was reached between the military regime of Zia ul-Haq and the Reagan administration. As a special Pentagon report reads: "Pakistan can serve as an extremely important intermediate point for the Rapid Deployment Force when airlifting it from Diego Garcia or the Philippines. In particular, the Pentagon received the right to dock aircraft carriers and other U.S. Navy combat ships in the port of Karachi. The foreign press reports the construction of an American air base in Oman on the coast of Pakistan's Belujistan. Moreover, the U.S. received permission from Pakistan to build a electronic reconnaissance station and to set up strategic military reserves to support combat actions in the Indian Ocean zone and to collect intelligenct information.

Thus, in its own way, Pakistan is being drawn into the aggressive expansionist policy of the U.S. in South Asia, and in its broader plan--in the Indian Ocean zone in general. Generous American military aid serves as its material base. In recent years, Washington has supplied the regime in Pakistan with all manner of modern arms on a very large scale. There is a large influx of F-16 fighter bombers capable of delivering a nuclear weapon (according to foreign press reports, a deal to deliver 40 such aircraft has been concluded), SIDEWINDER air-to-air missiles, HARPOON anti-ship missiles, 203.2 mm howitzers and other weapons. Deliveries are likewise planned for E-2C HAWKEYE remote electronic detection and control aircraft. New types of armaments are offered to Pakistan by the U.S.'s NATO allies; Great Britain with its frigates, SEA WOLF missiles and electronic guidance and reconnaissance systems and France with its MIRAGE-5 aircraft, etc.

As reported in the Western press, to add to the above, President Reagan, in a letter to Zia ul-Haq in the fall of 1984, offered the American "nuclear umbrella," which produced a well-founded alarm among the countries of South Asia. Foreign observers believe that the realization of this proposal could lead to the deployment of American atomic weapons on Pakistan's territory. Islamabad's nuclear ambitions, its attempts to possess its own "Islamic atom bomb" also evokes ever-increasing uneasiness among neighboring countries.

These large-scale deliveries of American arms to Pakistan are made not only in exchange for its active participation in the undeclared war against Afghanistan. At present, the country's territory has been turned into a stronghold of the Afghan counter-revolution. Already more than 100 camps for training terrorist bands of mercenaries have been set up. Islamabad plays the role of springboard in Washington's aggressive policy against India. In the arsenal of subversive activities of the Zia ul-Haq regime are both methods of provoking internicene clashes in India, and attempts to create a direct military threat to it.

U.S. policy in Pakistan, as one of the links of Washington's general course in the Indian Ocean zone, has transformed that country into an element which seriously destabilizes the situation in the region. In a certain sense, this is the most graphic example of the pernicious consequences of the blind and thoughtless following by the leadership of a developing state of the lead of the egotistical policy which the United States cooked up only in its own imperial interests.

Washington intends to expand its "Pakistan experiment" to other independent countries of the region. For this purpose the U.S. is stepping up political and economic pressure on Bangladesh and Sri Lanka. In Bangladesh, the Pentagon's strategists would like to begin to secure access to the port of Chittagong and the island of St. Martin which ties in to the Pentagon's plans to establish supply centers, and then basing areas, for navy ships. In Sri Lanka, Washington has gained the right to use the strategically important ports of Trinkomali and Colombo, having nurtured plans to create basing points for the RDF. The United States wishes to expand its influence on still other liberated states of the Indian Ocean: Madagascar, Mauritius, Comoros and the Seychelles. The Pentagon already has communications and satellite tracking

stations in the Seychelles as well as on Mauritius. The U.S. Air Force is using an air base on the Cocos Islands.

The Pentagon assured itself a firm position in Australia, whose ruling circles approved the construction of the American base on Diego Garcia. Since the mid-1970s the United States has continuslly made use of the major naval base at Cockburn Sound on Australia's Indian Ocean coast not far from the port of Perth. Its chief purpose is support of the activities of American naval units in the Indian Ocean, including nuclear submarines. Aircraft carriers and other ships from the Seventh Fleet based in the Western Pacific regularly visit Cockburn Sound.

North West Cape, a base in the northwest part of Australia, is used by U.S. ships. The most important American military site in the country are the previously-mentioned complex of space communications stations in Pine Gap, Bumera, and Alice Springs. In early 1985, Australia's government, succumbing to pressure from Washington, put at the disposal of the Pentagon's military clique yet another military site, the airfield in Sydney, from which the American Air Force could conduct tests of its most modern ICBM's.

Moving to the eastern part of the ocean, in return for military aid to Thailand, the U.S. again gained access to airbases on its territory, in particular, to Utapao. from which American bombers carried out combat sorties during the aggression against Vietnam. According to foreign press reports, the Reagan administration concluded a series of agreements with Thailand on placing spy planes and refueling craft at such bases.

In all, there are almost 30 U.S. military bases and national military sites utilized by the Pentagon in the Indian Ocean zone. All these are constituant links of a united chain of numerous overseas bases and advance groupings of U.S. military forces in the Pacific basin--in Japan, the Philippines, and in Micronesia. At the same time, they are linking up with bases of the U.S.'s allies, South Africa (intelligence information from the Indian Ocean region is collected at bases in Simonstown and Silvermine), France (Reunion and Mayotte), and New Zealand. It is for just this reason that the United States declared the Indian Ocean its "third strategic zone" after Europe and the Middle East.

THE BLOC POLICY OF THE U.S. Along with building up its own military presence in the Indian Ocean zone, the United States is earnestly drawing its partners into its militarist preparations. This primarily includes the countries comprising the asociation of Southeast Asian nations (ASEAN), Indonesia, Malaysia, Singapore, Thailand, the Philippines and Brunei, which the U.S. is attempting to push on to a road of militarism in order to knock together a pro-American military bloc. In particular, the volume of military deliveries to ASEAN members has increased in recent times.

In this vein, it is appropriate to emphasize that the Philippines has already offered their military bases at Clark Field and Subic Bay, which have significantly improved the U.S. opportunities to use its military might in the Indian Ocean. According to foreign press data, the United States has gained the right to the exclusive use of no less than six regions in the Philippines,

where various military sites are located. In 1979 and 1980, immediately after the revolutionary events in Iran and Afghanistan, U.S. Navy carrier groups were dispatched to the Indian Ocean and Persian Gulf from the Philippines.

Australia acts as an active accomplice and go-between in smoothing out Washington's military contacts with the ASEAN countries. The U.S. and Australis, who, along with New Zealand, form the aggressive ANZUS bloc hammered together in the Pacific Ocean during the "cold war" years, are raising more persistently the question of activating the militaristic efforts of that alliance in the Indian Ocean. Like Washington, Canberra responds negatively to the idea of demilitarizing the basin and favors the buildup of American military forces there. The Australian Air Force patrols the waters of the Indian Ocean. More and more often military maneuvers are conducted on Australian territory or close to its shores within the ANZUS framework. The collection of espionage information on the actions of other states' fleets is an important direction of ANZUS activity in the Indian Ocean. However, not all the bloc's members will be led by the reins by Washington without reservation. Under pressure from the growing anti-military movement, the government of New Zealand banned port calls by American ships with nuclear weapons on board or which have nuclear power plants.

The United States has likewise not halted its attempts to hammer together new military blocs in the region, specifically, the dangerous idea of putting together a military alliance in the Persian Gulf has been nurtured for many years; it would include Pakistan, Saudi Arabia, Oman, Bahrein, and possibly other countries. As a starting point, Washington has taken steps to increase the degree of integration of military efforts of the Persian Gulf states. At the Reagan administration's initiative, in early 1982, a number of Arabian Peninsula states passed a draft "defense plan" which envisioned the creation of a unified military force and a single air defense system in the region. They did not succeed in implementing this plan for a number of reasons unrelated to Washington.

PSYCHOLOGICAL PRESSURE. The intensification of U.S. military preparations in the Indian Ocean is accompanied by the intensification of ideological expansion and psychological pressure against the peoples of the region's states. Practical steps are being undertaken to strengthen the material base of the psychological war. In particular, new radio stations for the "Voice of America" in the Philippines, as well as in Sri Lanka, are being constructed. It should be noted that the Sri Lanka radio center would be the largest in that part of the world. Its six stations will allow the organizers of psychological subversion to broadcast to the countries of Asia, East Africa, China and the Soviet Union's Central Asian republics. The subversive "Deutche Welle" (FRG) radio center which coordinates its activities with the headquarters of psychological war in the U.S. also figures in here.

The chief content of the propaganda war of Washington and its allies are tired stereotypes of the notorious "Soviet military threat," about some "Russian drive for warm water ports" and the mythical "threat to Islam" on the part of the USSR. Thus, in the course of the last five or so years, provocative fabrications about the events in Afghanistan and those surrounding it have been earnestly exaggerated. Along with this, the United States is attempting,

as forcefully as possible, to hitch the regimes obedient to it, especially Pakistan, to its propaganda chariot. The Zia ul-Haq regime, bound hand and foot by its military relations with the U.S., obligingly carries out the role prepared by Washington of yes-man and collaborator in psychological attacks on the Soviet Union, Afghanistan and India. Every now and then hostile pronouncaements concerning the USSR, staunchly in a spirit of psychological warfare, are issued from Islamabad.

While providing broad military and material aid to the Afghan counter-revolution, the Pakistan regime also conducts actual ideological aggression against neighboring sovereign states in cooperation with its overseas allies. The mercenaries resort to use of state radio stations in Peshawar and Quetta, from which anti-Afghan propaganda is broadcast, in order to organize subversive actions against the DRA. Islamabad is helping the ringleaders of the Afghan counter-revolution to print large runs of leaflets and other subversive material later showered upon the territory of the DRA.

Especially perfidious and dangerous psychological actions are being carried out by the U.S. against India. Actively heating up the present Pakistan regime's anti-Indian policy, Washington exerts constant pressure on Indian society. With this there is wide practice of the tactic of floating rumors, allusions, and "leaks of reliable information" in order to present India's policies in a false light and escalate the tension in its relations with Pakistan and other neighboring countries. The goal of such psychological attacks is obvious; on the one hand it is to increase tension in Indo-Pakistan relations, and on the other, to "justify" an increase in the military grants to Islamabad. In turn, the Zie ul-Haq regime readily supports the fables about the "Indian threat" thrown up from across the ocean, since they help Pakistan to receive money and weapons, to stir up and maintain an anti-Indian mood, to distract public opinion at home and abroad away from the scandalous violations of elementary democratic norms, from the tyranny and lawlessness which reign in Pakistan today.

The subversive activities of the special services of the U.S. and its allies which is a component part of Washington's policy of international terrorism in the region is causing even greater alarm and indignation among the peoples of Asia and Africa. The fanning of separatist tendencies, internicene hatred, political assassination and other perfidious methods are used by U.S. special services here.

OPPOSITION TO AGGRESSIVE AMERICAN POLICIES. The U.S. military preparations, and the psychological war unleashed by it, have caused serious concern on the part of the countries of the Indian Ocean zone. The idea of declaring this basin a peace zone was first raised as far back as 1970, at the Third Conference of Non-Aligned States in Lusaka. A special U.N. committee on the Indian Ocean, joined by 48 countries, was set up in 1972. Among them were not only coastal states but also those which actively use the vast water and air expanses of the ocean, including all permanent members of the Security Council. In 1981, an international conference was to be held to develop practical measures to implement the U.N. declaration designating the Indian Ocean a peace zone, which was adopted at the XXVI General Assembly Session in 1971. But due to U.S. obstructions, the conference was not convened. Efforts

are underway to organize and hold it in the first half of 1986. The United States unilaterally broke off Soviet-American negotiations on limiting military activity in the region.

The desire of the peoples of the countries of the Indian Ocean to guarantee peaceful development for themselves receives the invariable and logical support of the Soviet Union, for whom it has great importance. The only ice-free water route linking the European and Asiatic parts of our country, actively used by the USSR's merchant fleet, runs through the Indian Ocean. Soviet military ships pay visits to the ports of friendly countries in accordance with established practice and in full compliance with the norms of international law. While protecting its lawful interests as a great sea power, the Soviet Union assists the peoples of the region struggling to establish a peace zone in the Indian Ocean. Therefore, in 1984, the USSR proposed, without waiting for the convocation of the conference, to undertake concrete steps which would facilitate the weakening of tension in that part of the planet. Specifically put forth were proposals not to dispatch large naval units there, not to hold exercises, and not to expand and modernize military bases in those coastal states which already have such bases. The U.S. and its allies did not respond to this constructive initiative.

The development of multilateral cooperation between the USSR and the region's countries is of great importance to the cause of peace in the Indian Ocean basin. The Soviet Union has concluded treaties of peace, friendship and cooperation with India, the People's Democratic Republic of Yemen, the Yemen Arab Republic, and Ethiopia, which have exerted a positive influence on the situation in Asia and Africa. This has yet again shown the true essence of the diametrically opposed goals of the policies of the USSR and the United States. Following its mercenary hegemonistic interests, Washington has created dangerous hotbeds of tension in the Indian Ocean zone and provokes conflict and wars. The Soviet Union, on the other hand, spares no efforts to assure a fundamental improvement in the conditions in this important region of the globe and to curb the arms race there, and desires that the Indian Ocean not become the "third strategic zone" of the U.S., or a sphere of tension and conflicts, but rather a zone of peace and neighborliness. As the General Secretary of the CPSU Central Committee, Comrade M. S. Gorbachev said, the USSR "has always favored and does favor peace and security in Asia, and equal cooperation between the states of the continent. This fully includes the Indian Ocean basin. We have supported the idea of transforming the region into a peace zone."

1. For details concerning CENTCOM's activities, see: Zarubezhnoye voyennoye obozreniye, No. 3, 1983, pp. 9-10. Ed.

2. For details concerning the Diego Garcia military base, see: Zarubezhnoye voyennoye obozreniye, No. 6, 1984, pp. 71-74. Ed.

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U.S., NATO CAPABILITES, PLANNING FOR ELECTRONIC WARFARE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 10-15

[Article by Col V. Tamanskiy, Candidate of Technical Sciences; "Electronic Warfare in U.S. and NATO Plans," passages rendered in all capital letters printed in boldface in source]

[Text] The aggressive North Atlantic bloc's leadership, in its plans to achieve military superiority over the Soviet Union and the nations of the socialist commonwealth, along with its build-up of nuclear and conventional arms, is also paying serious attention to electronic warfare (EW), which it sees as an integral part of the conduct of operations and battles. Direct, annual expenditures for this purpose will exceed seven billion dollars for the major NATO countries in 1985. This is visibly reflected in the ever-expanding outfitting of troops and naval forces with various kinds of electronic equipment that has a substantial influence on the military might of the armed forces.

One NATO military text stresses that EW assets ought to be deployed in a timely manner and their effects coordinated for the purpose of creating a unified striking force of fire, maneuver and EW. The text notes that the commander ought to devote just as much attention to questions dealing with EW as he does to the employment of weaponry.

The steady functioning of EW assets, in essence, affects decision-making in troop and weapon control, the conduct of reconnaissance, and the employment of navigation. According to an evaluation by Pentagon specialists, the skillful use of EW forces and resources when conducting combat operations under modern conditions allows one to devote a lot of attention to how the operations are proceeding to achieving assigned objectives in an operation (battle) with a significant decrease in losses to one's own forces. In particular, the use of EW assets during the U.S.'s aggressive war in Vietnam, made it possible, they estimate, to decrease aviation losses by more than a factor of six.

As noted in the foreign press, ELECTRONIC WARFARE is, in itself, an aggregate of measures and troop activities that come about as a result of: electronic resources for troop and weapon control, reconnaissance and navigation; countermeasures with this equipment; and assuring that one's own electronic

resources will continue to function steadily while the enemy is conducting EW. EW's component elements are the ability to conduct EW, electronic countermeasures (ECM), and electronic counter-countermeasures (ECCM).

Target search, interception of electromagnetic emissions, position location and identification based on intercepted emissions parameters, and also a determination of their importance are carried out while conducting measures to support ELECTRONIC WARFARE.

ELECTRONIC COUNTERMEASURES are intended to deceive the enemy, decrease the effectiveness of his measures, and suppress or destroy any detected radio electronic measures. This is done by transmitting false information, the use of active and passive jamming, and special or conventional weapon fire.

ELECTRONIC COUNTER-COUNTERMEASURES are directed at ensuring the steady functioning of one's own electronics equipment by creating for the enemy the most unfavorable conditions for their detection, determining locations, making identifications, and conducting countermeasures. As such, ECCM, as noted in the foreign press, ought to be conducted by units and formations in all service branches, and not only by special EW subunits. This kind of shielding activity has prompted serious attention being paid to electromagnetic compatibility between EW equipment and the electronic equipment for troop and weapon control, reconnaissance, and navigation. As experience in recent military conflicts has shown, not paying enough attention to this issue has led to serious losses during combat operations. In particular, one of the reasons for the sinking of the British guided missile destroyer SHEFFIELD during the Falkland (Malvinas) conflict was the electromagnetic incompatibility among ELINT equipment, satellite communications, and ECM.

The ability to carry out such a complex of measures interconnected by target, terrain and time, on the scale of the NATO unified armed forces, requires, as witnessed in the foreign press, the development of a single policy in the field of organizing and conducting EW, distributing the appropriate forces and resources, coordinating their activities with those of units and subunits which remain subject to national commands, etc. All of these questions are solved in NATO through centrally-coordinated military control organs beginning with the military committee, the supreme high commands of NATO's unified armed forces in the war theaters, and the TVD commanders-in-chief and going down to the commanders of formations and units.

The United States occupies the dominant position in questions dealing with EW, as in many other issues dealing with the conduct of war. The experience they obtained in the aggressive wars in Korea and particularly in Indochina, has been molded into the foundation of the organization and conduct of EW by the armed forces of the other nation-participants of the North Atlantic bloc. However, national peculiarities, conditioned by the availability of a scientific and technological development base, the level of production and the ability to supply formations and units with the necessary EW materiel, plus the organizational structure of the troops are also all taken under consideration.

Under modern conditions where the whole physical environment, i.e., land, sea, and air, becomes the combat arena, in NATO specialists' view, several changes have to be made in the organization and conduct of EW.

First and foremost, attention has been turned to new ways to formulate the objective of EW. U.S. headquarters considers it necessary to have EW assets which decrease the effectiveness of enemy electronic assets and obtain information on their functioning which is required for combat employment of one's offensive and defensive weapon systems. At the same time, it is deemed important that one protect one's own command and control systems. EW should be so designed that effective use can be made of active and passive means of ECM against all levels of the enemy forces' control and reconnaissance systems.

American specialists assert that an effective use of resources conducting EW will require timely reconnaissance of enemy radar and communications equipment.

Aware of the fact that the enemy's system of armed forces control is a broad network of organs and control points, nodes and separate communications assets, the NATO command encourages that they be carefully reconnoitered and a comprehensive data base be created of the electronic assets of all aspects of the enemy's armed forces control systems. Based on this data base, it will then be possible to plan concrete EW measures.

The tactical control link electronic resources relate to the basic countermeasure objectives, and the sequence of activities based on it will be directly determined during the course of the battle, depending upon the actual situation which develops. Thus, the army corps commander is obliged to allocate his EW and reconnaissance forces and resources so as to ensure the execution of the combat operations plan. He must also determine whether he ought to thwart or use to his advantage the enemy's troop control and communications systems between divisions and the next higher chain of command. The division commander makes the decision to destroy or utilize these enemy systems between divisions and lower levels.

In order to counter enemy armed forces control system objectives, it is considered necessary to organize the overall employment of EW assets by organizing active and passive jamming and electronic deception as well as by delivering nuclear strikes in combination with conventional weaponry. In the future, the use of ballistic and cruise missiles is not to be ruled out to deliver countermeasures equipment on control sites located within the deep rear.

The pages of the foreign press have also begun devoting a lot of attention to the operational efficiency of using EW forces and equipment. To a great degree, the effectiveness of a concentrated strike depends upon the enemy's system of armed forces control. The main requirements are the effective acquisition of electronic resources data on troop and weapon control, assembly, processing and reporting on a timely basis to the responsibile decision-making official. It is considered that these tasks ought to be fulfilled in near real-time. For example, NATO specialists assert that the

whole decision-making cycle for such tasks ought to take no more than fifteen seconds.

In order to achieve the necessary operational effectiveness, it is recommended that the information flow concerning radio electronics resources which ensure enemy armed forces control as well as the collection and processing of received data, be organized on a phased basis. Intelligence data necessary for planning ought to be received and processed in good time, but that data needed immediately to make a decision concerning allocation of forces and materiel to conduct countermeasures on targets ought to be processed rapidly.

Judging from press reports, the NATO command, however, considers that the enemy is also undertaking analogous activities. Hence, intense consideration is being devoted to questions of ELECTRONIC COUNTER-COUNTERMEASURES. It is considered necessary to undertake measures to assure the steady functioning of one's own control system by creating the most favorable conditions for the operation of the electronic resources making up the installation. Foreign specialists relate technical reconnaissance systems, which for the most part are electronic, to the control system and try to ensure their combined operational stability.

As noted in the foreign press, the operational stability of the control system for one's own armed forces under conditions where the opposing side is conducting EW, may be provided by carrying out technical and organizational measures. Technical measures involve chiefly the development, production and outfitting of units and subunits with equipment for electronic troop and weapon control, reconnaissance, and navigation which have high resistance to jamming over a wide spectrum of utilized electromagnetic waves, which can be quickly retuned to working frequencies, which use correcting codes, adaptive reception and data processing systems, and which increase the energy of emitted signals, chiefly by means of widening their spectra. For example, one official American manual stresses that EW opportunities will most likely be employed throughout the entire range of the electromagnetic wave spectrum. It is necessary that special attention be paid in the future to millimeter and optical wave bands.

Organizational measures involve conducting special personnel training to work under conditions where the enemy is using electronic countermeasures, the creation of mobile and shielded control points, the placement in reserve and duplication of the most vulnerable elements of armed forces control systems. Furthermore, the foreign press notes, besides enemy countermeasures, one's own radio technology can affect the functioning of the armed forces control system to a certain extent. Hence, the NATO command is setting tasks maximally to coordinate the plans for the development, production and equipping of troops and the combat employment of the resources for armed forces control and EW.

NATO's military and political leadership is continuously improving the organizational structure of EW units and subunits, and is equipping them with modern equipment for conducting electronic countermeasures and enemy electronic resources reconnaissance. Several differences in viewpoints on the role and place of EW in the combat operations of several of the NATO countries' forces as well as in their technological and production bases have

had an impact on the organizational structure of the national EW units and subunits. However, in the majority of instances, the nation-participants in NATO are, in practice, oriented to the measures carried out in this field by the U.S. armed forces in the organization and conduct of EW.

In the North Atlantic alliance countries' armies, EW decision-making is made in the following subunits: the company, battalion, and regiment (group). For example, the U.S. ground forces intend to have a reconnaissance and EW company in each brigade, in a division, a battalion, and in the corps, a group.

Foreign military specialists consider that regardless of the nature of the armed conflict, it will be necessary that ground and air forces, and, in maritime theaters of military operations, naval forces, to be employed jointly. Thus, it is not incidental that EW questions are examined as an entire armed forces' issue as well as on a service-by-service basis.

The conduct of electronic warfare in the ground forces basically rests upon the division and corps radio and electronic reconnaissance, direction finding and ECM equipment which is mounted on special vehicles, armored transporters, and army aircraft and helicopters. However, there are two distinct features which are characteristic of the U.S. ground forces: the attempt to solve EW tasks simultaneously on the ground and in the air and an effort to combine the forces of ELINT and EW within the framework of a single unit. The latter feature, in the opinion of American specialists, allows one to solve more effectively the tasks of reconnaissance and EW with a rational use of technical resources.

A great deal of attention is devoted in the organization of electronic countermeasures in the NATO ground forces to single-use jamming transmitters, which can be delivered to an area for jamming objectives by planes, missiles, artillery, or personnel. In selected areas, such transmitters operate automatically for several dozen minutes and suppress the enemy's electronic equipment at ranges of up to several kilometers. It is considered that the wide use of single-use jamming transmitters will, to some extent, compensate for the limitation in the effects of airborne and especially ground active jamming equipment. At the same time it will reduce somewhat the workload on one's own troop and weapon control equipment.

U.S. ground forces' division and army corps possess the most complete system of resources which will allow one to fulfill EW tasks on the ground and in the air (See table). Their use in military operations, according to American specialists, will make it possible for staffs and troops to conduct reconnaissance and suppress radio lines in the ultrashort wave and as well as ground and air radar up to a considerable depth.

The NATO air forces have created EW squadrons--and in certain instances, wings--for detecting electronic troop and weapon control equipment, detect countermeasures, and protect one's own similar type equipment. They are capable of affecting the enemy's air defense control system by jamming it, and at the same time, substantially decreasing losses to one's aviation performing these tasks. EW units and subunits have air defense radar-jamming planes (the American EF-111A, Italian G222VS, and the West German HFB-320), special

RECONNAISSANCE AND EW ASSETS OF THE U.S. GROUND FORCES

NAME	PURPOSE AND BASIC CHARACTERISTICS	SYSTEM COMPONENTS AND CARRIER
	CORPS EQUIPMENT	
GUARDRAIL-5	COMINT (20-75; 100-150 and 350-450 MHz) with direction finding (DF) in the first two bands	6 RC-12D aircraft (2 planes on rotational watch for search and direction finding). A ground data processing and control center in three trailers.
AN/TSQ-112 TACELIS	SIGINT of radio communications with DF (0.5-500 MHz.	The control center is on 1 10-t and 3 6-t trailers, 2 main DF layouts on 3 5-t trailers and 4 DF stations on 1.25-t vehicles.
AN/ALQ-133	Radar intelligence with DF (0.5-18 GHz).	Army air OV-1D MOHAWK aircraft.
AN/TLQ-15 AGTELIS	Radar intelligence with DF (0.5-18 GHz). Circular probable deviation when determining the location of a radar is 30 m (at a range of up to 30 km from the radar).	The control center with 3 intel and DF stations each go on a 2.5-t vehicle.
AN/TLQ-15	Radio communications jammer (1.5-20 MHz). Power output 2 kW.	1.5-t vehicle
AN/ULQ-11	SIGINT with DF and radio jamming (2-80 MHz). Power output 70-500 W.	9 air army RU-21H aircraft (4 for DF, 3 for intercept and control, 3 for jamming)
	DIVISION EQUIPMENT	
AN/TSQ-114 TRAILBLAZER	SIGINT (0.5-150 MHz with DF (20-80 MHz).	2 control centers on 1.25-t trailers and 3 DF units on 0.25-t vehicles.
AN/MSQ-103 TEAMPACK	Radar intelligence (0.5-40 GHz).	0.25-t vehicle, trailer or transporter.
AN/TLQ-17A	SIGINT and radio communications jamming (1.5-80 MHz). Power output of constant signal, 0.5 kW; pulse signal, 2.5 kW.	0.25-t vehicle with single-axel trailer.

DIVISION EQUIPMENT (CONT)

NAME	PURPOSE AND BASIC CHARACTERISTICS	SYSTEM COMPONENTS AND CARRIER
AN/MLQ-34 TACJAM	Jamming of radio communications stations in shortwave and ultra-shortwave bands. Power output 3-4 kW.	2 tracked transporters and a trailer.
AN/ULQ-14	Radar jamming (8.5-17 MHz).	1.5-t trailer
AN/ALQ-151 QUICKFIX	SIGINT with DF and radio communications jamming stations (2-76 MHz). Power output up to 150 W. Weight of device more than 300 kg.	Army air helicopters

aircraft to fire upon and destroy ground radar (the American F-4G), as well as planes to suppress communications nodes and individual enemy antiaircraft control systems (the American EC-130H). All of these planes fall under the category of NATO country group protection air assets. Likewise, directly in the zones where enemy air defense weaponry is located, EW tasks are performed by strategic and tactical aviation aircraft which have onboard EW systems that fall under the category of individual protection equipment.

ECM planes are equiped to reconnoiter and jam enemy air defense radar. Judging from materials in the foreign press, the most sophisticated plane of this type is the American EF-111A equipped with an AN/ALQ-99. This device consists basically of ten jamming transmitters with a combined effective output of about 1 MW, highly sensitive receivers to detect and determine the parameters of enemy radar emissions, and a device to process and store data. The electronic installation allows the crew to detect and suppress radars at ranges of 400 and 300 km, respectively. During combat operations, the EF-111A is capable of covering, by jamming, strike group operations from safe holding zones (about 50 km from the FEBA), and accompanying strike groups on flight paths heading toward the target, as well as jamming enemy air defenses with radio electronic means during direct air support to the ground forces.

Special planes for firing on enemy ground air defense radars are equipped with radars to search for and determine the location of targets, and they have anti-radar homing missiles on board. At the present time, as noted in the foreign press, the U.S. Air Force alone has more than 110 such planes in its inventory.

Planes used to suppress nodes and individual enemy air defense control system communications equipment are intended to destroy the functioning of the lines of control communications through tactical aviation. They also possess the means to search out and determine the location of targets and suppress them.

In order to cover wide frequency bands, several jamming transmitters and different kinds of antennae are used, including a towed wire antenna that is more than 100 meters long and is extended while the plane is in flight.

Among the means of individual protection mounted on NATO strategic and tactical aircraft are sets of equipment which have detection receivers (two varieties), an ECM station, and a passive jamming device built into them.

The first type of receiver is intended to warn the crew (pilot) of the plane's being illuminated and to determine the level of danger various sites may have (their range of operation is 200-150 km., their accuracy in determining direction--10^0. The second kind of receiver is used to warn the crew of the enemy's launching of a "ground-to-air" or "air-to-air" guided missiles. It allows the crew to carry out the necessary maneuver in time or employ passive jamming in the form of anti-radar deflectors or false target traps.

ECM stations which emit jamming signals (mainly noise and responder signals) thwart the functioning of control radar for air defense missile batteries and artillery and, at the same time, decrease the vulnerability of one's own aviation while penetrating air defenses and striking enemy sites. 30 The structure of passive jamming permits the programmed firing of pyrotechnic cartridges with anti-radar deflectors and false infrared target traps which disrupt the guidance of the missiles to the plane.

It is anticipated that the naval forces of the nation-participants in the North Atlantic Bloc will use EW forces and resources to solve two basic issues: to ensure the concealment of ship formations entering the areas of combat operations and ensure their protection against guided weapons. Foreign specialists consider that from their very nature, these tasks are somewhat contradictory since the first one is concerned with limiting the functioning of radio electronics and the second one with activating the functioning of EW equipment. In order to overcome this contradiction, it is anticipated that the two functions will be performed on a phased-basis. During the preparation stage and as formations begin entering a prescribed region, attention ought to be primarily focused on maintaining concealment. But as they gradually come closer to the zone of combat operations, the accent is then shifted to shielding the ships from guided weapons.

In the first stage, the mode of operation of EW equipment ought to conform maximally to the general operational deception plan and should be strictly controlled. During the second, it is recommended that reconnaissance and countermeasures assets be actively brought into play and electronic resources employed by the enemy to control formations and weapons be suppressed.

At the present time, the naval forces of the nation-participants of NATO have at their disposal the resources of radio and electronic reconnaissance, active and passive jamming on surface ships and the aircraft and helicopters of both carrier and land-based aviation. In particular, surface ships are outfitted with equipment installations which ensure protection from anti-ship missiles. Along with the assets for active jamming, passive jamming devices are also assigned an important role. According to an evaluation by English specialists, passive jammers spoke well for themselves during the conduct of

combat operations during the Anglo-Argentine conflict. In the near future, it is being considered that surface vessels will be outfitted with complex deception systems (to create a false electronic and sonar situation) as well as to strengthen control in the mode of operation and level of ships' electronic resources emissions.

Naval aviation has come to make use of EW assets for group protection by having them mounted on the EA-6B PROWLER (U.S.A) electronic jamming aircraft, which is intended to support the operations of carrier aircraft while negotiating enemy antiaircraft defenses. Naval aviation also uses EW equipment for individual protection by mounting it on all other planes and helicopters.

Judging from the materials in the foreign press, present-day EW assets do not completely achieve the basic goal--countering the enemy's system of armed forces control. Further improvements and developments in EW equipment are being carried out basically along two directions: the complex use of radio and electronics reconnaissance equipment and automatic fire control for destroying detected targets; the integration of radio and electronics reconnaissance with the means to automate control, ECM, and weapon firing.

The development and distribution to forces of the PLSS reconnaissance and strike system (U.S.) is the first concrete realization of the first direction. It is intended mainly for countering ground radio wave-emitting targets, primarily enemy air defense radar. Its component elements consist of: aircraft equipped with electronics equipment to do reconnaissance and relay intercepted radar signals to the ground control center; mobile radio navigation net ground sites for determining aircraft coordinates the moment they transmit a relayed signal to the control center; and a ground center with automated information-gathering and processing equipment which provides the location of the enemy's air defense radar and guides the weapon to that location. In the future it is envisaged that the system's combat capabilities will be expanded by incorporating a supplemental element to do reconnaissance and determine the location of control system radio communications, jamming transmitters, and other emitting systems.

The second direction of creating a unified integrated system for the united NATO armed forces has yet to materialize, but it has been reflected in the wide system of interrelated EW measures which the Israeli command carried out during the aggression in Lebanon. Here the following components were put to use: radio and electronics reconnaissance equipment on pilotless aircraft, specialized ECM planes (based on the American Boeing-707), and tactical aircraft; electronic countermeasures equipment on specialized ECM planes, pilotless and tactical aircraft; and a control center and weapons mounted on special planes for hitting air defense radars (F-40 WILD WEASEL). The complex use of such an arsenal of resources with a common control center made it possible for the aggressor to get the advantage in gaining air superiority.

Having learned from the experience gained by imperialism's aggressive wars in recent years, foreign specialists are developing more-improved reconnaissance and countermeasures electronics as well as specialized means to destroy detected sites. In improving reconnaissance assets, efforts are being

directed primarily at increasing the sensitivity of receivers, expanding frequency bands, decreasing the time it takes to determine the parameters of received signals, increasing the precision of direction finding, and decreasing equipment weight, dimensions and power consumption. In creating electronic countermeasures equipment, efforts have been directed at increasing the energy potential of active jamming equipment, expanding the working frequency bands, and developing equipment to jam in the optical spectrum.

The bloc's military and political leadership is demanding that a single policy on a scale encompassing all the nation participants be put into practice that will develop and produce EW equipment which will surpass developments they have made vis-a-vis the enemy's troop and weapons control resources. Hence, NATO's plans quite obviously express the effort to create all the necessary preconditions and conditions to conduct a full-scale battle for supremecy in every aspect of the physical environment. Electronic warfare has taken on an aggressive nature and has turned into a specific form of combat operations.

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Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 17-20

[Article by Col K. Vladimirov; "The 56th PERSHING Guided Missile Brigade"]

[Text] In November, 1983, in accordance with the decision reached at the NATO council session in December 1979, on deployment of new American medium-range missiles in Western European countries, the U.S. Army leadership achieved practical realization of the plan by equipping the 56th Missile Brigade, stationed in the FRG, with the PERSHING-II medium-range ballistic missiles.

Attempts to present this move as so-called "modernization" of the existing forward-based American missile brigades does not correspond to reality; qualitatively new systems of nuclear missiles are being deployed in Western Europe. The Soviet Union presented the principal evaluation of this event. "The American missiles," as stated at the December 6, 1983, Moscow press conference, "which will be deployed in Europe, will be strategic weapons, relative to the USSR."

Immediately following deployment of the PERSHING-II missiles on FRG territory, replacing the obsolete REDSTONE missile system which had a range of 600-800 km, the U.S. Army leaders set about their modernization and perfection of the missile subunits' organizational structure. The main task in the modernization was reducing the vulnerability of the missile system by increasing its mobility, transportability and readiness in general. The missile system which was improved was the PERSHING-IA. High mobility for the missile system was achieved by placing all of its components on a wheeled carrier. Readiness was raised by improving the testing and launching equipment and automating the missile preparation and launch.

The battalion was made the basic oragnizational unit of the PERSHING-IA missile system. It has four firing batteries (9 missile launchers each) and one headquarters and service battery. The strength is 1,368 personnel.

There were four PERSHING-IA battalions in the U.S. Army, three of which were permanently stationed in the FRG and were part of the 56th Brigade, with headquarters at Schwabisch Gmund (about 55 km east of Stuttgart.) The 41st Artillery Battalion, 1st Division, is also stationed at Schwabisch Gmund, the

81st Artillery Battalion, 1st Division,at Neu Ulm, the 84th Artillery Battalion, 3rd Division, in the population centers of Neckarsulm and Heilbronn, the 9th Artillery Battalion, 3rd Division, at Fort Sill, Oklahoma.

Altogether there were 108 PERSHING 1A guided missile launchers in the 56th Brigade. At the end of 1983 they comprised one of the main operational-tactical means of the U.S. Army for delivering nuclear strikes for the NATO armed forces in the European Theater of War.

At the beginning of the 70s, the U.S. set about development of a more powerful missile delivery system for the Army, designated, according to the American press, to replace the obsolete PERSHING-IA missile. The developers were prcsented a demanding task, in particular, to increase the range to more than double that of the PERSHING-IA and increase the accuracy of delivery of the warhead on the target,. Utilization of modern technology and technological advances employed in the development and production of other types of missiles and ground equipment permitted Martin Marietta to develop for the Army a qualitatively new means of delivering nuclear munitions, the mdedium range ballistic missile PERSHING-II.

According to reports in the foreign press, the PERSHING-II MRBM, with a nuclear warhead, is able to destroy a target at a range of 1,800 km, and its CEP does not exceed 40 m (time of flight to maximum range is 12-14 minutes). Such a range, by American experts' estimate, ensures the U.S. the possibility of using it as a first nuclear strike against targets in the Western USSR when launched from the FRG. In the opinion of Pentagon spokesmen, PERSHING-II missiles are designated for striking defended targets, among which are ballistic missile silos, major command posts, command and control centers, nuclear weapon storage sites, etc. The new missiles in the nuclear arsenal have capabilities which significantly exceed those required for missions carried out in the interest of the army theater command, for example requirements of the Air-Land Battle Concept.

To shorten the deployment time of the PERSHING-II MRBM in Europe, it was decided to use the existing material base and organization of the 56th Brigade. The minimal amount of work in re-equipping positions and building other brigade sites, as well as the rapid retraining of experienced PERSHING-IA missile crews, should, in American specialists' opinion, ensure only an insignificant reduction in combat readiness during the period of rearming the battalions with new missiles.

The principal PERSHING-II subunit capable of independent combat mission accomplishment is the battery, composed of three firing platoons. Each platoon has one station for preparing the missiles for firing from three launchers, which ensures the independence of the platoon from the battery during selection of the launch position. Additionally, each launcher has automatic pre-launch check and preparation-for-launch equipment which permits it to carry out missile preparation and launch to planned targets without depending on the firing platoon. As opposed to the PERSHING-IA battery, where the battery command post is the only direction center for missile launch, each PERSHING-II MRBM firing platoon has a separate command post, which makes it possible to substantially increase the autonomy and energy of its combat

employment, greater dispersion of the firing platoons, and speed up a change of positions within the battery area if necessary.

Acording to reports in the foreign press, another important distinguishing characteristic of the ground equipment of the PERSHING-II is the possibility of launching from practically any suitable launcher location without previous preparation or survey. Among the vehicles in the battery is a station which prepares initial data on new targets for retargetting. Communications equipment includes a switchboard, an AN/TRC-144 radio with antennas, and encoding equipment.

The two-stage solid-fuel PERSHING-II missile is deployed on a redesigned launcher which is a two-axle chassis semi-trailer which is towed by a 10-ton tractor made by the German firm, MAN. The launcher with its autonomous electrical generator, missile and warhead (payload of over 9 tons) can travel on dirt roads with an average speed of 60 km/h and a cruising range of 800 km. Within the TVD launchers can be transported by C-130 aircraft, and to other TVDs on heavy military airlift.

A warhead was developed for the PERSHING-II which can maneuver in the final stage of its trajectory. It has a warhead (with a TNT equivalent of from 10-20 kt up to 100 kt) with two variations--for air or surface detonation and for detonation in the ground. The latter ensures destruction of a target underground to a depth of 30 m. The possibility of developing a separating (into three nuclear rounds) warhead is being studied, and a warhead is being developed which has 400 kg of conventional explosives. However, in the opinion of American specialists, use of such warheads significantly reduces the range and accuracy.

High accuracy is achieved by a homing radar in the warhead which is operational during the terminal phase of the flight (at a height of 1,615 km over the target). The radar homing system's scanning antenna (two revolutions per second) assists the onboard computer to form an image of the target region, which is compared with a standard stored in the computer memory. The results of this comparison are used to develop guidance commands in the execution section of the homing system.

Improved ground equipment helped reduce the overall quantity of battalion vehicles and personnel (to 938 personnel).

Rearming the 56th Brigade's battalions with the PERSHING-II MRBM is taking place by battery. According to foreign press reports, at the present time the 1st Division's 41 Artillery Regiment is fully rearmed, and its firing batteries are relocating to the area of Muttlangen (north of Schwabisch-Gmund), as well as the 3rd Division's 84th Artillery Regiment, whose batteries are deployed in Heilbronn. One firing battery from each rearmed battalion is on 24-hour alert in a state of full combat readiness (missile launch requires several minutes from the moment the order is received) at an equipped launch site located 100 km from the permanent battalion deployment site. According to reports in the foreign press, such brigade positions may be in the vicinity of Kleingartach, Inneringen, and Bettingen, which were used earlier for combat which for PERSHING-IA batteries.

In the estimate of American specialists, the tempo of rearming the 56th Brigade -- one battery every nine weeks -- corresponds to the plan. In the middle of October, 1984, the American press reported that deployment of the PERSHING-II missile was proceeding at an accelerated tempo and that five batteries had been rearmed with the missiles (45 of 108 launchers), and that by the middle of 1985, eight batteries, or 72 launchers of the brigade would be capable of supporting missile launches. It is believed that the rearming will be completed by the end of 1985. Following that, it is intended to rearm the battalion in the USA. Besides that, at the White Sands Training Center (New Mexico), a training battery will be established (six launchers). Altogether, it is planned to have 150 PERSHING-II launchers in the U. S. Army.

After the PERSHING-II batteries have been rearmed with the new missiles and brought on line, they enter a 12-week daily combat training cycle. In accordance with this schedule, one of the battalion's four batteries must remain on 24-hour alert status. Launchers with warheads attached are deployed at launch sites by platoons, ground checking equipment and combat crews maintain a high state of readiness so that, in a minimum amount of time from receipt of the launch order at the command post, the battery can accomplish preparation for launch to the planned target.

Other batteries of the battalion can be at their permanent posts, at the training site, or in maintenance. One of the batteries in an advanced state of readiness compared to the other two to substitute for the alert battery or quickly double the number of PERSHING-II launchers on nuclear alert in the NATO armed forces.

During the training period a firing battery will periodically be moved in the Quick Reaction Alert area. Changing positions, according to reports in the American press, will take place by platoons, and more often than that envisioned for PERSHING-IA launchers. During training, the firing platoons and batteries, in general, will train to launch missiles. In higher-level exercises (brigade and higher), training it is intended to practice simultaneous deployment to the Quick Reaction Alert area of up to three batteries of a battalion. According to data published in the foreign press, before preparation for military actions on order of the Commander-in-Chief of the NATO armed forces in Europe, all PERSHING-II missile launchers will be pulled from their permanent stations and will occupy launch sites in secret remote alert areas.

In the arsenal of each firing battery there are 13 PERSHING-II missiles, nine of which are emplaced on launchers, and four designated for rapid replacement of deadlined, or those which fail to pass the prefiring check in the firing platoons. Such reserves, in American specialists' opinion, should ensure a high level of technical readiness in each firing platoon.

According to data in the American press, by the end of the 80s the program is intended to produce 917 PERSHING-II missiles. It is believed that this quantity of missiles permits supporting their necessary stock and expenditures for the training launchers, but also establish a sufficient supply for

repetitive reloading of the launchers during the course of combat actions for conducting repeated missile launches.

As is apparent from announcements by United States and NATO leaders, PERSHING-II missiles are planned for employment as a first strike weapon for the purpose of, together with other nuclear missiles, to "destroy" the Soviet Union and other Warsaw Pact countries. The Soviet Union has often explained with the facts and figures in hand that equipping forces and emplacing these missiles close to the borders of the socialist states are acts intended to upset military parity in Europe and to obtain unilateral advantages for the U.S. and NATO. And, in answer to this, are those who forced the conversion of the territory of several Western European countries into American launching sites.

1. The ballistic, two-stage, solid-fuel missile PERSHING-IA has a launch weight of more than 4.6 tons, a maximum range with a nuclear warhead of 740 km, and a 490-m CEP).

2. In other foreign press sources, 2,500 km. Ed.)

3. For more on the Air-Land Battle Concept, see Zarubezhnoye voyennoye obozreniye, No1 7, 1984, pp. 29-35. Ed.)

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FRENCH AIR DEFENSE ORGANIZATION REVIEWED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 20-24

[Article by Col A. Simakov; "France's Ground Forces Air Defense"]

[Text] The country's military-political leadership, supporting the militaristic aggressive course of NATO, is carrying out a wide complex of measures, directed at increasing further the strike and fire power of the armed forces, including the ground forces. At present, an armed forces' development plan for 1984-1988, is being carried out, in accordance with which the organizational structure of the formations, units, and subunits is being perfected, and the troops are being equipped with comtemporary weapons and combat equipment. An important place in the plan is assigned to the question of protecting troops and rear targets from raids and strike by enemy aircraft and helicopters.

According to ground forces headquarter's views, air defense (PVO) is one of the main types of combat support. Under contemporary conditions, it is already a part of combat operations in that the outcome of a battle may depend on its effectiveness. The main mission of PVO is the protection of formations and units, command points and rear regions from enemy aircraft. It is intended to be accomplished by the forces and equipment of troop air defenses in cooperation with the forces and equipment of the national air defense forces and Tactical Air Command fighter aircraft.

It is reported in the foreign press that the main missions of protecting rear targets, formations and units will be accomplished by the surfac-to-air missile systems IMPROVED HAWK and ROLAND, organizationally downgraded to a regiment subordinate to a corps.

The general leadership of the forces and equipment belonging to ground forces' PVO is entrusted to the 1st Army's Air Defense Command, which plans the combat training and employment of air defense missile units. It is also concerned with questions concerning the organization of cooperation with the armed forces' PVO command and Air Force tactical aviation. The deputy commander of PVO artillery carries out these missions in the army corps, and the chief of division artillery for divisions.

Currently, judging by the information in the foreign press, there is one IMPROVED HAWK SAM regiment and two ROLAND SAM regiments in the 1st Army Corps, in the 2nd Army Corps one and two; and in the 3rd Army Corps one of each. Air defense of formations, units and subunits is intended to be accomplished by the 30-mm twin-barrelled, self-propelled anti-aircraft systems (found in the armament of ROLAND regiments), 20-mm anti-aircraft guns and portable air defense missile systems MISTRALE (comprising the armament of several divisions' regiments. For combatting the air enemy, a 20-mm gun, installed on combat infantry vehicles, and 7.62 machine guns on tanks and armored vehicles may also be used..

According to reports of the French press, the IMPROVED HAWK SAM regiment (approximately 1,100 personnel) is intended to protect an army corps' troops and rear targets, its second echelons and reserves from enemy air strikes primarily from medium altitude. At the same time, military specialists consider that the tactical-technical characteristics of the SAM (maximum intercept range, 70 km, maximum intercept altitude, 18,000 m, minimum intercept altitude, 30 m) allow it to destroy air targets at both high and low altitudes. The regiment (Fig. 1) consists of a control and service battery, and four firing batteries (each with six launchers). In it there are 24 SAM launchers, more than 20 radars of various types, transports, and other equipment. The regiment's unit of fire is 144 missiles, 72 of which are located on the launchers.

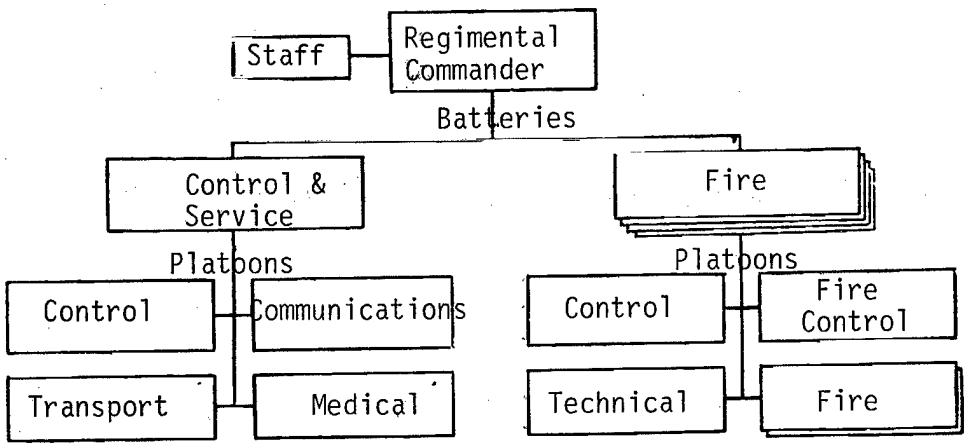

Figure 1. IMPROVED HAWK SAM Regiment Organization

The regiment's main tactical and firing unit is a battery, which consists of two fire platoons (three launchers each).

As the foreign military press reports, for conducting combat operations, the IMPROVED HAWK regiment is deployed in a combat formation (commmand post and battery firing positions) corresponding to the corps commander's battle plan, which specifies the mission, character of operations of the troops being protected, and enemy potentials to deliver air strikes, etc. It is emphasized that in organizing the protection of formations operating in a corps'first echelon, the distance of the regiment's firing positions must preclude their destruction by enemy artillery (up to a 20 km from the line of contact) and insure mutual fire support. During the conduct of combat operations, a battery is deployed in an area roughly 0.1 km^2.

The missile resupply point is located 1-5 km from the launch position. French military specialists consider that a regiment's combat potential (utilizing its full capabilities) allows it to protect an 8,000 km^2 area from enemy air strikes. For the destruction of low-flying targets, this area is halved.

The ROLAND regiment is intended to protect first echelon combat formations and units, and also other army corps targets (the maximum intercept range, 6.2 km, minimum intercept range is 260 m, maximum altitude, 5,500 m, minimum altitude, 15 m). It can be employed both in its entire composition, or by battery. At present, there are two types of ground forces regiments: the ROLAND regiment (Fig. 3) and the mixed ROLAND regiment. The first (around 900 personnel) consists of a control and service battery and four firing batteries with eight launchers. In all, in the regiment there are 32 ROLAND launchers, 32 VAB armored personnel carriers, around 180 various vehicles, and other equipment. The second type of regiment includes a control and service battery, three firing batteries and a 30-mm ZSU [self-propelled AA system] battery. It has approximately 900 personnel. 24 ROLAND launchers, twelve 30-mm ZSUs, 24 VAB BTRs and 150 vehicles, and other equipment.

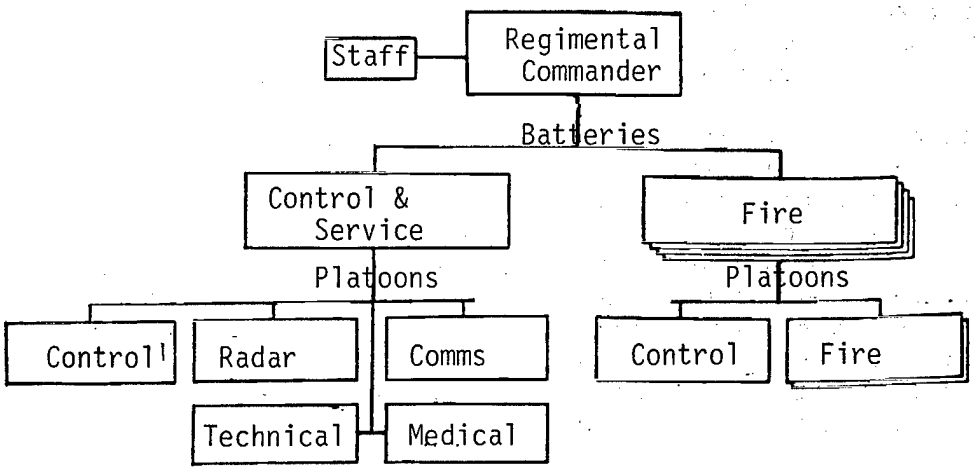

Figure 3. ROLAND Regiment Organization

As French military specialists emphasize, a battery is the regiment's main tactical and fire unit. It comprises two platoons (four launchers in each). It is considered that one platoon can protect a 100 m^2 area from enemy air attacks, and during a troop march--up to 12 km of the march route. During a march, the platoon's launchers operate at a distance of 3-4 km from one another. On the whole, each ROLAND regiment is capable of insuring the protection of the combat operations of two regiments of a division.

In all, in an army corps' PVO units' armament, there are 72 ROLAND launchers, and 24 30-mm self-propelled anti-aircraft guns. In addition, in several army subordinate units there are 20-mm anti-aircraft guns. For example, in a motorized infantry regiment there are 12. These systems, according to the opinion of the ground forces headquarters, are capable of covering the main grouping of the corps in all types of comabt with a certain degree of effectiveness.

In divisions, air defense is accomplished by batteries of 20-mm anti-aircraft guns and MISTRALE platoons, included in the organizational structure of motorized infantry (infantry), armored cavalry, artillery and other regiments. The French command considers that it is possible to combat low-flying aerial targets with standard armament, especially 20-mm guns and anti-aircraft machineguns, which are mounted on tanks, BMPs, BTRs and other equipment.

According to reports of the foreign press, the process of reequipping ground forces PVO units with new equipment, and also of bringing subunits of divisions' anti-aircraft artillery up to normal strength, will continue to 1988. Work is being conducted to create a self-propelled, short-range, air defense missile installation based on the MISTRALE PZRK [mobile air defense missile system], which is intended to be installed on a wheeled armored vehicle. At present, the question of the replacement of the IMPROVED HAWK SAM system with the American PATRIOT is being considered.

Training of the personnel of a ROLAND regiment is carried out in a special school in Nim. The training conducted in 3- and 10-week courses. In addition, in the units, officers and non-commissioned officers are becoming familiar with new types of equipment being placed into service.

An important place in training the crews of air defense missile systems is the training of launcher operators, which are selected from enlisted military personnel. Their training course is broken down into theory and practice. Instructional wall posters, video tape recorders and other training aids are used in the course of theoretical lessons. Practical lessons initially are conducted on trainers, simulating a launcher. The operations for detecting and tracking the target, launching the missile and conrolling it during flight, and obseravation of the launch results are worked out on the trainers. Then, lessons are conducted on-site where the future operators are given the opportunity to track the flight of combat aircraft and helicopters and to work

out blank launchers. The last phase of training is live firing at the test firing ranges at Biskaross in the Mediterranean.

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MULTI-FUNCTIONAL RADIO LOCATION STATIONS IN SAM COMPLEXES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 24-29

[Article by Lt Col (Reserve) K. Pavlov; "Multi-Functional Radars in SAM Batteries"]

[Text] NATO's militarist circles, seeking to attain military superiority over the socialist countries, continue to intensify efforts to develop new types of military hardware. In particular, much attention is directed at surface-to-air missile sites (ZRK), which are at present the basic system for combatting an air opponent. In a complex air environment typified by high-density utilization of diverse, rapid-moving air targets that are highly maneuverable (piloted aviation assets, cruise missiles, pilotless aircraft, tactical and tactical/operational missiles), ZRKs, in foreign specialists' opinion, must have enormous fire power, a great degree of accuracy in striking targets, rapid reaction time and an all-weather operational capability.

These features of ZRKs are, to a large extent, assured by using multi-purpose radar stations (MF RLS) which conduct, virtually at one and the same time, search detection and tracking of air targets and direct to them several air defense guided missiles (ZUR). As reported in the foreign press, phased array antennas, digital data-processing methods, and high-speed computers have made it possible to establish a field of view very rapidly, to increase substantially the number of targets tracked and fired on simultaneously, and to reduce significantly the reaction time of the sites. Furthermore, there has been an increase in RLSs survivability and in their ability to withstand jamming from electronic warfare measures, including anti-radar missiles. ZRKs with MF RLS began entering the arsenals of capitalist countries in the first half of the 1980s. These are the American PATRIOT system and the Japanese 81 (previously called TANSAM).

As indicated in the Western press, the patriot ZRK, which has been in the U.S. Army's inventory since 1982 (and was later adopted by a number of other NATO countries), has the distinctive capability of tracking up to 100 air targets and simultaneously directing fire at eight of them, including three with terminal guidance. The combat capabilities of this system are enhanced thanks to the use of the AN/MPQ-53 MF RLS and a high-speed computer installed at the AN/MSQ-64 control post. It is noted that one such RLS is able to carry

out missions that would require five [stations] in a battery of the obsolete NIKE HERCULES ZRK.

The MF RLS conducts search, detection, intercept, identification and tracking of air targets as well as directing ZURs to them. Further, a combined guidance method is employed: mid-course radio command and the so-called Track-via-Missile (TVM) terminal phase. The latter type of guidance differs from the more common, semi-active version in that target-reflected signals received by the single-impulse homing head (GSN) are not processed aboard the missile, but are relayed to the AN/NPQ-53 radar station. These signals are compared with the ones reflected from the target and received directly by the station. The computer control post processes data about the target and the missile and develops guidance commands which the radar station relays to the missile. American experts believe that this method is complex, but it ensures the required ZRK resistance to jamming when advanced EW systems are being used.

The AN/MPQ-53 MF RLS (which weighs more than 10 t) with a phased array antenna operates in the 4-6 GHz frequency range on 160 fixed operational frequencies. Its equipment is positioned on a tandem-axle semi-tractor-trailer, the M80, which is transported by the M818 wheeled tractor (6 x 6). The tractor and semi-trailer measure 15 m in length, are 2.9 m wide and 3.6 m high.

To a large extent, the functioning of the RLS has been automated. The station is serviced from a control post by a combat detachment consisting of two operators. Each operator's work station has an air situation display, a device for inputting data into a computer, control units, and a block for operational control of the equipment in the system.

One of the basic elements in the control post is the computer, which performs all calculations, analyses and aggregation of required data. It is used to solve the following problems based on data obtained from the RLS: determining the characteristics of the air assault systems; identifying intercept targets; transmitting control commands to the RLS; establishing the target data processing sequence; selecting protective measures against forms of interference being employed. The computer consists of two processors, two memories and peripheral units. Its operating rate is one million operations per second.

The forward section of the RLS cab has an antenna system, which, in a combat operational mode, is placed at an angle of 67.5^0 to the horizontal plane. The cab is placed in a horizontal position by using hydraulic jacks, which align the station on a platform with an angle of inclination not exceeding 10^0. The RLS' operational sector is selected by rotating the cab in the required direction. When the cab is in a fixed position, the radar station can search and detect targets along a 90^0 sectoral azimuth and can track them and guide missiles within a 110^0 sector. While in transit, the antenna system is mounted on the cab's top. The standard container-type cab has within it the RLS' interface unit for the AN/MSQ-104 control post, the RLS operational control device, a transmitter, receiver (without the blocks extended to the cab's top), and a signal-processing device. It is noted that the equipment is protected against the effects of electromagnetic pulse caused by a nuclear

blast, electrical discharges occurring during thunderstorms and electromagnetic interference.

The interface unit receives and decodes commands emanating from the control post and also codes and transmits to it reports from the radar station. Command signals and reports are transmitted by a cable that is protected against electromagnetic pulse caused by a nuclear blast. Commands coming from the control post determine the operational mode, the direction of radiation, RLS operational frequency, the ways of processing radar signals, and the ways and means of defending against jamming.

Along with the computer control post commands, the control device synchronizes the operation of all the RLS units and formats the data on processed radar signals, both those reflected from air targets and those received from missles, in order to transmit them [i.e., the data] to the control post. A specialized computer is the basic component in the device, which also contains a data input-output unit, in interface with the identification system, and a microprocessor to control the position of the antennas' beam pattern.

The basic difference between the AN/MPQ-53 RLS and stations previously used in ZRKs is an antenna system containing the following phased array antennas. The basic antenna, receiver [antenna], "friend-foe" identification system, and five additional ones (each with 51 elements) used in the side-lobe suppression system.

The basic phased array radar (FAR) antenna is used to reflect and receive signals during target search, detection and tracking; to transmit missile-guidance commands in the mid-course band, and to reflect the target illumination signal in the Track-via-Missile mode. It has 5,161 single-type phase shifters and, in its shape, is similar to a circle 2.44 m in diameter. The phase shifter (17 cm in length and weighing 124 gr) is a ferrite toroid, filled with a material having a high dielectric constant. It is intended for passing a signal with a 2.5 kW power pulse (the average power level reaching 13 W). Phase shifters can be switched into four positions: 180^0, 90^0, 45^0 and 22.5^0. Switch time does not exceed 12 msec, which is significantly less than that required for all operational modes except for "Track-via-Missile." Signal reception in this [latter] instance is performed by using a special antenna located beneath the primary FAR.

To ensure operation in the Track-via-Missile mode, the receiving antenna is made in the form of a planar FAR having a circular shape (54 cm in diameter) and containing 251 elements. The antenna receives the required information from aboard the missile only when it is being guided during the terminal phase. At all other times, it can be used in the primary FAR's side-lobe suppression system and for decreasing the effect of predetermined jamming.

In accordance with the control signals, the RLS' transmitter forms and amplifies high-frequency oscillations, which, depending on the station's operational mode, differs in terms of modulation type, pulse repetition length and frequency, power-level and operating frequency. Small- and medium-power travelling-wave tubes make up its basic structure, along with an output amplifier with criss-crossed fields.

The station's receiver provides reception of reflected signals, their amplification, dual frequency conversion, reception sensitivity adjustment based on the strength of the signal being received, pulse distance strobing, and signal correlation. Further, it detects and analyzes jamming, provides protection against it, and converts the intermediate frequency into video signals.

The receiver has six high-frequency input channels. Equipment for three of them is installed in the comparator unit, located in the top of the RLS cab. The comparator helps form an aggregate and two different channels used in the detection, tracking and missile command guidance modes. Equipment for the other three channels is installed in the extended electronic units structurally co-located with the antenna system. One of the receiver channels is used to jam the primary FAR's side lobes when the target detection and track modes are in operation, while the other two are used for the "Track-via-Missile" mode. They amplify the signals received by the receiver-antenna and by the additional FARs used to jam the side lobes.

Doppler-pulse signals reach the latter channels, whose outputs have analog- and digital-type processors. Reaching the analog processor are signals which are relayed from the ZUR to the AN/MPQ-53 RLS and which, at an earlier point, were reflected from the target and received by the missile's GSN. They are amplified, compressed, gated and subjected to narrow-band filtration and analog-digital conversion. The signals then reach the digital processor, which correlates them with the target-reflected signals received by the additional FARs. The correlated signals are range-gated and further processed in accordance with the modes for detecting and tracking targets and directing missiles toward them.

Signal-processing in the target detection and tracking modes is done by sorting out, in the appropriate device, digital signals from four channels (the aggregate, two difference, and the one for side-lobe suppression) into in-phase and quadratic components, by forming [them] into machine language, and by recording them in the buffer. At a later point, they are used in the secondary stage of data processing.

In the search mode, the signal processing device helps suppress the primary FAR's side-lobe pattern; in detecting signals with a specified constant false-alarm probability; in determining the range to a target and its angular coordinates; in conducting target identification measures against a background of local interference (including that based on a scenario previously imputted into the memory device); in neutralizing the effects of passive interference employed by the enemy. In addition, the above-cited device prepares reports that are transmitted to the computer's control post.

In the missile's mid course, ZUR-transmitted signals are processed in the command guidance mode to determine its angular coordinates, range, and data on the flight control devices' operating condition. The results obtained are used in the control computer for subsequently guiding the ZUR to the target.

When processing data in the Tracking-via-Missile mode, Fast Fourier Transmission is used to perform range-gating and burst processing of reflected illumination pulses. These data are also transmitted to the computer control post. The foreign media note the complex target-selection logic executed in this high-speed computer ensures increased accuracy in guiding ZURs under the above-cited conditions by using parametric evaluation of the active jamming measures employed by an opponent against the missile's GSN and land-based RLSs.

All RLS subsystems are equipped with built-in control equipment which, for all intents and purposes, functions continuously when required, the operator can provide the station with a computer-developed diagnostic test. The transmitting device is shut off when serious defects in the RLS are detected. It is reported that the built-in equipment makes it possible to detect nearly 95 per cent of all possible defects at the station.

The multi-purpose Doppler-pulse RLS with a planar FAR is also used in the Japanese short-range 81 ZRK fire control system. The station seeks, detects air targets, and issues launcher guidance and ZUR firing commands. This particular RLS determines three coordinates (azimuth, angles of elevation and range) and has two functional modes -- circular and sector. When operating in the first mode, the antenna is rotated a circular motion (in azimuth), while the FAR scans electronically in elevation. In the sector mode, target coordinates are determined in an azimuth sector not exceeding 110^0, and in elevation of up to 30^0.

The RL provides simultaneous tracking of six air targets. Of those, the computer identifies two which pose the greatest threat and are closely monitored by the station. It releases data for guiding two launchers. The first ZUR can be fired within 8 seconds after target detection and identification. A 6-second interval must be maintained between missile firings. As cited by Western press reports, this particular radar has an air target detection and tracking range of nearly 20 km. According to foreign experts, the weakness of the "81" configuration lies in the fact that its RLS does not conduct ZUR guidance but only prepares source data for subsequent missile target guidance by onboard IR GSNs. It is believed that this reduces the ZRK's effective firing range and renders it unsuitable for all-weather use.

To be sure that the IMPROVED HAWK ZRK remains in the active inventory until the end of the 1990's, American experts are looking into the possibility of configuring it with a single MF RLS instead of the four types of RLS which it now has. As a prototype of another RLS, consideration is being given to FLEXAR radar developed by Hughes Aircraft, which, according to foreign press accounts, is capable of guiding missiles to ten targets simultaneously. It is assumed that using it will produce roughly a four-fold increase in the system's fire power and significantly decrease its reaction time. Reducing the overall number of RLSs in a IMPROVED HAWK ZRK battery will lead to its improved mobility. In addition, personnel levels to service the system are expected to be cut in half. Western experts believe that all of this will bring about a significant decrease in resources expended. The small area

required to house RLS equipment will make it possible to co-locate it with the command post in a standard-size container placed on a 5-ton vehicle.

The station's operating frequency range is 8-12 GHz. Western press accounts have noted that its impressive tactical-functional features are assured thanks to using an FAR-type antenna with electronic scanning and a high-speed computer, digital data-processing equipment, and a multi-mode transmitter with rapid frequency retuning.

A distinctive feature of the FLEXAR RLS lies in its use of adaptive signal-formation circuits, which generate signal pulses based on analytical data from a previous series of pulses. The digital processor used at the radar makes it possible to change signal-processing modes and to select automatically the form and parameters of a reflected signal as a function of target trajectory and jamming conditions. American experts believe that the FLEXAR RLS has an enhanced moving-target indicator (MTI) capability against a background of reflections from the earth's surface and local features. This is attained by radiating, in the search mode, coherent signal pulses with a high repetition rate which changes with target speed, and by using "jamming charts" inputted into the digital computer's memory.

The RLS antenna (1 m in diameter) rotates at 60 rpm. Its beam conducts simultaneous electronic scannings along the azimuth and angle of elevation. To ensure semi-active ZUR self-guidance, the station illuminates an air target at the mid and final segments of a missile's flight path.

According to an assessment by foreign experts, using the FLEXAR RLS in an IMPROVED HAWK system will make it multi-channel and sufficiently stable in providing protection against modern electronic warfare measures. It will also make it possible to fire effectively at several targets, including multiple ones.

As noted in the Western press, the MFS-90 (FRG) and the SA-90 (France), are now in the conceptual design phase, and conceivably, will replace the IMPROVED HAWK at the end of the 1990s. Both systems will employ a three-coordinate MF RLS for air target search and tracking as well as radio-command ZUR mid-course guidance. Additional requirements for guiding it will be handled by a radar GSN. It is assumed that the MF RLS will function in the 7-12 GHz frequency range. Diagram 5 depicts an experimental variant of the French multifuncational radar station, developed by the firm of "Tomson -- CSF."

Thus, capitalist countries, first and foremost the members of the aggressive NATO alliance, are actively engaged in increasing the effectiveness of

surface-to-air missile systems, in particular by introducing multi-purpose RLSs, based on the latest developments in science and technology.

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SOUTH AFRICAN GROUND FORCES EXERCISES EXAMINED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 31-32

[Article by Maj M. Chernykh; "South African Ground Forces Exercises"]

[Text] As announced in the foreign press, in August--September 1984, on the territory of Kaap province, an exercise was conducted by the 7th Infantry Division, airborne subunits and the Air Force under the code name TENDER CHARIOT (in all, about 12,000 personnel, more than 4,000 vehicles of various types and more than 70 combat aircraft).

Its main goal was to verify plans and work out the methods of combat employment of ground forces, their organizational structure, which had been developed taking into account the experience of the armed aggression against neighboring independent states, the results of previous exercises and the increased combat potentials of units and subunits because of new models of weapons and military equipment having been introduced into service.

During the exercise the missions of mobilized deployment and bringing forces to combat readiness, perfecting the march, conducting an offensive battle, the organization of air defense, artillery and air support and also of combat and rear support were resolved. The main attention was paid to the questions of conducting highly maneuverable operation, maintaining the stability of troop control and reliable destruction of targets under complex conditions, primarily at night. Practical acceptance tests on the weapons of the ELPHANT tank, the G-5 and G-6 155-mm howitzers and the PC30 VALKIRIA, were carried out in the exercise.

In the preparation phase, after the division was fully mobilized, they conducted operational training of staff personnel and combat firing by units and subunits of all types of weapons on the firing range in the Sayshen region.

During the main phase, the questions of conducting offensive combat operations with the forcing of water obstacles (according to the plan, the conventional enemy has seized a number of areas on the opposite river bank and had consolidated its position there). While preparing for and during the offensive, artillery and air strikes were inflicted on the "enemy." A landing

was made in support of the forcing in darkness on the "enemy-"occupied bank by personnel of the airborne company (using three C-130G military transport aircraft) and by laying folding bridges by organic resources. The foreign press reports that for control of the night crossing across a water obstacle about 30 m wide, using a medium mechanized JIRDEN bridge, required not more than 2 hours. Tank units operated in the first echelon of the attacking forces. The motorized infantry followed behind them in armored personnel carriers.

Aircraft carried out flights from permanent and (field) airfields, executing airborne reconnaissance missions and rendering support to ground forces and air defense. The BUCANEER light bomber and the IMPALA fighters were used for direct air support and the isolation of combat operation areas, and the MIRAGE F-1C fighter-interceptor was used for covering forces from the air. Part of the forces operated behind "enemy" aviation. While carrying out exercise combat missions, live ammunition was used.

Artillery worked out the problem of rendering support to ground forces and conducting counter-battery fire. Delivery of a fire offensive to forestall the "enemy" at maximum range (in particular from the G-5 155-mm howitzer with rocket projectiles--up to 40 km) was considered one of the most important missions. Ammunition devices, mounted on trucks were used to improve the rapid fire of the PC30 VALKIRIA. During the exercises, more than 6,000 live artillery rounds were expended.

Rear subunits carried out missions of material-technical and medical support of troops. Material resources were delivered in 2-, 5- and 10-t trucks with improved cross-country performance, adapted for operating without roads and under semi-desert conditions. Much attention was paid to the organization of water supply by means of water transport in tank trucks. Special vehicles on BUFFALO light armored personnel carrier chasis were used for evacuation and medical help to the injured.

It is characteristic that, this, the largest South African exercise during the past decade, was accompanied by a demographic assertion by the ruling circle's representatives concerning the supposedly "defensive" character of the country's military preparations. At the same time, despite these hypocritical announcements, with the readiness picked up by the Western press, members of the South African leadership do not consider it necessary to reveal their real intentions. The boastful utterance of General M. Malan, South African Defense Minister, that the troops in the exercise exhibitied the ability "to fight at least as far as Cairo," eloquently testifies to this. In this way, the exercise which was conducted was a standard demonstration of force of the military-political leadership of Pretoria's racist regime and its strivings to continue to build up the armed forces' military might and to force tension in South Africa.

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NATO AIR DEFENSE OF BALTIC STRAITS REGION

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 37-40

[Article by Lt Col G. Veselovskiy; "Baltic Straits Region Air Defense"]

[Text] The USA and NATO militarists, preparing tp conduct aggressive wars, consider that their troops will be under the constant threat of enemy air attack during offensive operations. Therefore, as foreign military experts emphasize, in contemporary conditions, it will not be possible to count on success during offensive operations without reliable air cover.

It is noted in the foreign press that the primary PVO forces and equipment of NATO are concentrated in the Central-European TVD (around 1,600 air defense missile [ZUR] launchers, more than 500 PVO fighters, and 500 anti-aircraft artillery weapons). However, according to the opinion of the NATO headquarters, the Allied Armed Forces (OVS) will not be able to conduct strategic offensive operations in the main (Central-European) TVD successfully without reliable support of their flanks. In the plan, the Northern European TVD occcupies an important position.

One of the important regions in this theater is considered to be the Baltic Straits zone, through which pass naval lines of communication between the Baltic and North Seas, and the shortest air routes from the USA to large economic and administrative-political centers of the GDR, Czechoslovakia and Poland.

This zone includes the territory and coastal waters of Denmark, the West German land of Schleswig-Holstein and the strait zone of the Baltic Sea. It is considered to be a favorable region for the deployment of large groupings of NATO's joint air force and navy; and also for the deployment of PVO early warning systems. For example, the Danish paper "Land and People" reports that Denmark signed a secret agreement with the U.S. in May, 1984, to accept additional air squadrons--around 100 combat aircraft--from the U.S. Marine Corps aviation. On the basis of this, the paper notes, the total number of aircraft in the zone will almost double, approaching 200. In all, counting the reinforcement subunits from other NATO countries and the Danish Air Force, the strike grouping of the bloc's combined air force in the Baltic Straits zone may include 500 combat aircraft.

Air defense of military targets and the armed force grouping, deployed in this zone, is accomplished by the personnel and equipment of the Danish region (having one sector) of the Northern zone of NATO's combined PVO system in Europe and by the West German troops of the territorial "Schleswig-Holstein" command. It includes the command-and-control organs, detection and identification systems, PVO fighters, air defense missiles (ZUR) and anti-aircraft artillery (ZA).

The commander of NATO's Allied Air Forces in the region of the Baltic Straits accomplished command and control of the personnel and equipment through a regional operations center to which a sector operations center is subordinate. The first is located in an underground bunker on the territory of the headquarters of the Danish Air Force (Karup), and the second is located in Vedbaek (Denmark). Such a scheme, according to the assessment of the block's military leadership must insure command-and-control flexibility of tactical aviation and the PVO forces in peacetime, and their effective employment during wartime operations.

The personnel and equipment of PVO deployed on the territory of Schleswig-Holstein are operationally subordinate to the commander of the 2nd OTAC.

Radar sites located at Skagen, Skrydstrup, Vedbaek, Stensved, and on Born Holm Islands moniter the air space above the Baltic Straits zone, part of the water area of the North and Baltic Seas. The last is located in the immediate proximity of the coastline of the Polish People's Republic and the GDR in order to provide the capability to detect air targets over their territory.

All radar sites are equipped with the NATO HADGE PVO personnel and equipment automated command and control system and cooperate closely (primarily on questions regarding the exchange of information) with radar sites in Mokkera (Norway) and in Breckendorf (FRG).

Information about the air situation from the sites is transmitted via secure communication lines to the PVO sector operations center (Vedbaek) and simultaneously (in formalized form to the PVO regional operations center (KARUP). After processing the information in a computer, it is sent to a display system and utilized by the Commander, Allied Air Forces in this region, for making decisions.

Judging by reports of the foreign press, during exercises on the territory of Denmark, a network of visual observation sites (approximately 400) is deployed. Observation teams are staffed by Danish Air Force Reserves (approximately 10,000). Collection, the initial data processing on the air and the above-water situation, its transmission to the centers, and also to command, control and notification sites is carried out at the observation sites. In addition, air support controllers (former pilots) with communications sets, who may direct aircraft to air and ground targets, are located at the sites. According to NATO specialists' opinion, these sites increase the survivability and effectiveness of the command and control system for PVO personnel and equipment in the region.

F-16 fighters from the 723rd Fighter Squadron and F-104s from the 726th Fighter Squadron (rearming to F-16s, both squadrons are located at Alborg Air Base, Denmark) play a primary role in combatting enemy aircraft in the Baltic Straits zone. In all, there are 32 aircraft. According to the experience of NATO exercises, Danish Air Force fighter-bombers and West German Air Force fighters based on Schleswig-Holstein territory and German naval aviation (in all, 100 aircraft) may also be used to execute PVO missions.

As mentioned above, the modern multi-purpose F-16A aircraft are used in the Danish Air Force primarily as PVO fighters. The first pilots for the new aircraft were trained in the United States in a pilot-instructor program. Under their leadership, the remainder of the pilots are retraining in small groups (3-10 people) at Skrydstrup Airbase in the course of 4-5 months. For two months they study a material section, the aerodynamics of the aircraft, instruction, etc., and the remaining time is spent in training flights on the fundamental types of combat training. The number of flights is established for each pilot depending upon his qualifications. The pilots, possessing sufficient flight experience in the F-104 complete 30-40 flights in the F-16. At the present time 1.35 pilots are trained on the average for each aircraft. It is planned to have 16 F-16A aircraft and 22 pilots in a squadron, and in addition, 5 on the airbase staff are trained to fly these aircraft. In the process of combat training, equal time is spent on working out PVO missions and delivering strikes on surface targets.

According to the information in the foreign press, each year, on the average, each pilot for the F-16 tactical fighter conducts 140 hours of flight (according to NATO standards they must conduct not less than 180 hours).

The air defense missile subunits in the Baltic Straits zone, as the Western press reports, are represented by three IMPROVED HAWK battalions (one Danish and two West German). Now they are deployed at peacetime locations, but in a threat period and with the beginning of a war, they are earmarked to relocate to the area of airfields and ports, planned for the disembarkation and loading of reinforcement personnel and equipment of the NATO joint armed forces. Therefore, in the process of combat training, the personnel of given subunits regularly train to rapidly transfer and deploy the ZRK to new positions.

In addition, PVO for airfields and ports is provided by batteries of 20-mm twin-barreled and 40-mm anti-aircraft guns intended to combat low-altitude targets.

The Western press notes that the combat readiness level of the PVO personnel and equipment in the Baltic Straits zone is sufficiently high. It is maintained by the NATO command both in the course of usual everyday activities, and in the numerous exercises, the primary ones of which are BOLD GEM, Bar Frost, and Blue Moon. During these exercises, the combat readiness system of PVO units and subunits, to transfer to a higher degree of readiness, is verified and perfected. Questions concerning detection and notification of the air enemy, and command-and-control of the operations of PVO personnel and equipment to repulse air raids are also worked out. The ZUR subunits work out operations for protecting the ground troops and navy during blockade operations of the Baltic Sea zone and for the barring of the passage of forces

of the enemy fleet, the landing of enemy air force and naval assaults on the Danish peninsula, and also during the conduct of offensive operations in the Jutland (coastal) axis. From the air, PVO fighters protect the ground troops and transport aircraft, transferring reinforcement along their flight routes. Tactical aircraft of the air forces of the FRG, Norway, USA and Great Britain participate in the majority of the exercises conducted in this region.

It is emphasized in the foreign press that the NATO command pays a great deal of attention to the questions of modernization, adopting into the armament new ZRKs, fighter-interceptors and systems for monitoring the air space.

At present, the replacement of the HAWK SAM system with the IMPROVED HAWK is being completed. It has a greater fire range and reliability for destroying targets in an ECM environment.

F-16 fighters continue to be adopted into the Danish Air Force. In the future, it is planned to equip them with new short-range and medium-range air-to-air guided missiles and a new identification system. Work is being conducted for installing an interface system with the E-3A airborne warning and control aircraft on PVO fighters.

In accordance with the plans to modernize NATO's PVO system, the new radar MARTELLO built by the English firm Marconi (working in the centimeter wave band, and a target detection range of up to 480 km) will be deployed at one radar site (Born Holm Island) by the middle of the 1980s).

For increasing the depth of the radar field, the interface system with the Airborne Early Warning and Control (DRLO) (E-3A aircraft) is being installed at radar sites. In particular, the system is already at the Skrydstrup radar site (becoming operational in 1983). The next site will be Vedbaek. The primary purpose of this system is to support the exchange of information on the air situation between the E-3A aircraft and ground sites. This essentially will allow expanding the possibility to detect and identify air targets (especially low-flying) and guiding fighter-interceptors to them.

The network of coastal radar sites is also intended to be modernized for the purpose of increasing their oportunity to detect naval and low-flying aerial targets. These sites will function independently, but will transmit the data to regional radar sites.

According to the opinion of the leadership of NATO and Denmark after the completion of the afore-mentioned measures, the combat potential of PVO forces and equipment in the Baltic Straits zone will grow significantly.

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SHERPA C-23A, U.S. AVIATION LOGISTICS IN NATO

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 49-50

[Article by Col I. Chistyakov; "The C-23A SHERPA Light Military Transport Aircraft"]

[Text] At the end of 1984, U.S. Air Forces, Europe began receiving the C23-A SHERPA light transport aircraft. In the Western press, it is noted that these aircraft are one element of the American EDS (European Distribution System) being developed in the European TVD. It is basically a new air force spare parts and engines operational supply system and is an addition to the U.S. Air Force's primary centralized rear support system.

In order to substantiate the necessity for creating such a system, American specialists made analyses, the main conclusion of which was: to support a high level of tactical aircraft combat readiness for executing their assigned missions with a sufficient degree of effectiveness, under Western European conditions, first of all, the supply of spare parts for their base airfields must be guaranteed. It was calculated, for example, that an interruption in supply is equivalent to a daily failure rate of 800 combat sorties and this, in turn, is the equivalent of reducing the ASAF tactical groupings in the European TVD by nearly 300 aircraft.

Judging by the Western press announcements, the EDS system includes the following basic components:

-- spare parts and aircraft engines are stored in various regions of Western Europe, in particular at the main airbase (the airbase at Zweibrucken, FRG) and the so-called forward airbases (the Prestwick airbase in Great Britain and Torrejon in Spain). It is believed that stockpiling the appropriate material resources at them allows a sharp reduction in the number of transport aircraft flights from the continental U.S. for supplying everything the U.S. Air Forces in Europe need to function normally in the European TVD.

-- a subsystem of automated record keeping, control and communications between tactical aircraft basing fields and the spare parts and aircraft

engine stockpiles, equipped with modern means of secure radio, telephone and telegraph communications.

-- special transport aircraft, equipped to transport by air, the necessary spare parts and equipment from the warehouses to the U.S. TAC AIR base airfields (there are 20 such airfields in Western Europe). In American military specialists' opinion, these aircraft must be capable of transporting freight which has the maximum dimensions of the J-79 or F-100 engines (installed in the F-4 PHANTOM, F-15 EAGLE and the F-16 FIGHTING FALCON fighters). Besides this, they must have the capability to execute flights to a range of 1,300 km with up to 2,300 kg of freight, to operate from poorly-developed airfields with shortened take-off and landing strips and also be equipped with onboard radio-electronic equipment permitting them to complete flights under the bad weather conditions characteristic of Western Europe.

According to foreign press evidence, the modernized version of the SHERPA cargo aircraft, made by the English firm Shorts Brothers, was selected as the means of transport for the EDS system as the one most fully meeting the requiements (this aircraft has the formal USAF designation of C-23A).

The SHERPA C-23A light military transport aircraft is an all-metal monoplane with a high-mounted straight wing, twin tail fins and a tricycle landing gear with a nose wheel. The power plant consists of two Pratt and Whitney PT6A-45R turbofan engines with a maximum power of 1,200 hp. The five-bladed propellors have a diameter of 2.82 m. It has onboard fuel supply of 2,180 l. There is a three-man crew: two pilots and a flight mechanic. The latter's duties include control over loading and off-loading operations when transporting freight and also carrying out the required technical servicing of the aircraft and its subsystems (in particular, preparations for repeated flights) during scheduled flights.

The aircraft's freight compartment (length, 9.09 m, width, 1.98 m, height, 1.98 m, useful volume, 35.64 m^2) has a square cross-section. Along its floor, and on the ramp, which opens up in the tail section of the fuselage, three guide rollers are installed simplifying the aircraft loading and off-loading process.

The principal tactical-technical characteristics of the C-23A are cited below.

According to foreign press reports, 18 C-23A military transport aircraft have been bought for the U.S. Air Forces, Europe. They will enter service in the 10th Air Squadron of the 322nd Air Wing (permanently based at Zweibrucken airbase). The delivery of all the aircraft is expected to be completed in October 1985.

Principal Tactical-Technical Characteristics of the C-23A SHERPA Aircraft

Weight, kg	
Maximum take-off	10,390
Maximum landing	10,250
Empty	6,440
Maximum payload	3,175
Speed, km/h	
Maximum cruising at 3,000 m with 9,525 kg of cargo	350
Economic speed at 3,000 m	290
Operational ceiling, m	
With 2 engines	6,000
With 1 engine	3,900
Flight range with maximum fuel supply, with a fuel reserve allowing 45 min and diversion to an alternative airfield not less than 80 km distant, km	
With 3,175 kg of freight	360
With 2,270 kg of freight	1,240
Take-off distance, m	1,040
Landing distance	1,225
Aircraft dimensions, m	
Length	17.69
Height	4.95
Wing span	22.76
Wing area, m^2	42.1

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WESTERN PLANNING, TACTICS OF NAVAL ASSAULT LANDINGS ANALYZED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 59-66

[Article by Capt 1st Rank P. Lapkovskiy, Candidate of Military Sciences and Capt 2nd Rank V. Nikolashin; "Amphibious Assault Operations"]

[Text] Leading United States reactionary forces of imperialism, in their attempt to secure for themselves a dominant position in the world, continue to accelerate military preparedness, directed at achieving military superiority over the Soviet Union and other countries of the socialist brotherhood. While giving birth to a strategy of "direct confrontation," these adventurous ideas of the USA, its colleagues and other aggressive blocs are paying a great deal of attention to the readiness of the Navy, together with the Air Force and ground forces, to conduct amphibious assault operations.

The U.S. Navy headquarters defines amphibious assault operations as an assault from the sea on an enemy who is defending his shores. It is organized around joint naval, air and ground forces for the seizure of important areas of an enemy coastline, littoral zones, islands, naval bases and ports.

Depending on the designated missions and makeup of the joint force, American defense specialists subdivide amphibious assault operations into three basic types: "invasion," "seizure," and "raid."

INVASION--operations of strategic significance, conducted in a TVD with the objective of transferring military action onto enemy territory to create a new front and to occupy all, or a significant part, of his territory. The composition of forces taking part in such operations could include one or more field armies, up to two marine expeditionary divisions, and several air-assault divisions. The marines are used as a first assault echelon.

SEIZURE--(action of an operational scale) pursues the goal of seizing and holding a designated area for future use as a staging area for landing more powerful troop contingents. Basic force components for such an operation usually consist of 1-2 expeditionary marine divisions, reinforced as necessary by ground and air force formations and units.

RAID--(tactical operation) normally carried out for reconnaissance, diversionary or demonstrative purposes. The forces designated for these types of operations consist of marine units (including up to regimental amphibious group size), serving as specially-designated fleet support forces.

Foreign military experts, based on the experience of numerous local wars and conflicts (Korea, Viet Nam, Egypt, Lebanon, the Falkland Islands, Grenada and others), and also operational and combat training, have reached conclusions about the increasing significance of amphibious assault operations under present-day conditions. For this reason, therefore, even in peacetime, in the course of numerous training exercises, they are working out amphibious assault landings under conditions where nuclear, conventional and chemical weapons might be employed in the face of strong enemy opposition. A distinctive characteristic of amphibious force training in the U.S. and other NATO countries since 1980, has been landings at night with the widespread use of infrared techniques.

In NATO specialists' opinion, the basic stages of amphibious assault operations are: concept development and planning, concentration of the assault force and amphibious transport at embarkation points (PP), loading troops and combat equipment in transports, a rehearsal landing, movement of the force by sea, landing and mission accomplishment on the beach (Fig. 1).

Working out the assault operation concept and plan occurs at the direction of higher authority who designates the operational objectives and missions, area of operations, composition of the assault force, amphibious force units, elements and detachments comprising the covering force, securing the seaborne and air assault on the beach and the operations there as well as the command and control organization.

A general operational plan is developed first. This is concurred in by ground, naval and air forces headquarters. It is fairly detailed, though sufficiently broad in order to account for changing situations.

On the basis of this general plan, separate plans (loading of troops and equipment, movement, rear security, etc.) are developed. In addition, the amphibious assault landing date (D-day) and the landing commencement time (H-hour) are designated. Special attention is paid to the questions of concealment, enemy deception, guaranteeing combat stability of the amphibious force at all stages of the operation, active suppression of the enemy anti-amphibious defenses (PDO), operational surprise and the massive use of electronic warfare.

Designation of the time to commence the amphibious assault is an important element of the planning process. Foreign specialists consider that landing in the hours of darkness gives a high probability of achieving tactical surprise by reducing the effectiveness of enemy aviation, artillery and tanks. Furthermore, daylight hours immediately following a night landing allow the amphibious assault operation to be developed rapidly. Moreover, the possibilities of designating aviation and fire support to the assault troops are limited at night (the influence of this factor can be diminished if surprise in the landing is achieved). This demands a high level of joint force

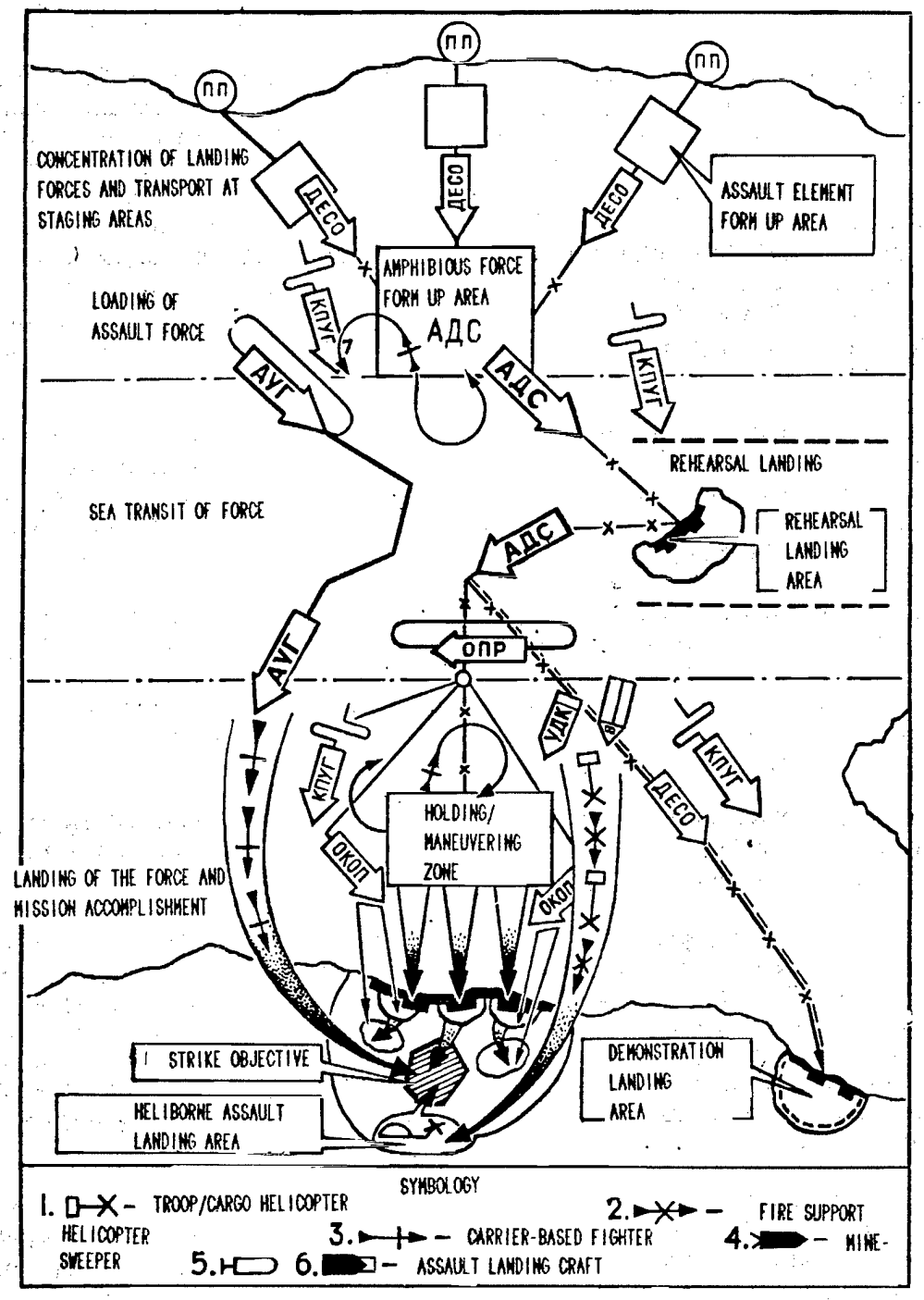

Рис. 1. Основные этапы морской десантной операции (вариант)

readiness for operations on land and at sea. Nighttime conditions also reduce the rate at which forces and equipment can be expanded on the beachhead by helicopters, because they can operate only at high altitudes which increases the probability of their discovery and destruction by the enemy.

Concentration of landing forces and their transport takes place in the following sequence. First, they load stocks of material technical resources and supply items, after that, the heavy weapons and combat equipment, and, finally, landing forces units and subunits.

Embarkation of the assault force can be done in two ways: administrative and combat. The first method is used when landings are to be made on beaches occupied by one's own troops in order to reinforce them or at ports seized from the enemy. This type of landing anticipates maximum use of the landing ships' and transports' high payload capacity. In the second method, troops and equipment are placed only at established places designated for this assault. This method is the basic one used when landing on defended beaches or ports.

It takes 8-10 hours to load the assault troops into general-purpose amphibious ships and helicopter carriers. If troop transports are used, 20 hours, and for tank landing ships, about 30 hours.

Defense of the assault force embarkation area can be accomplished by carrier battle groups (AUG), surface action and surface hunter-killer groups (KUG and KPUG), shore-based patrol aircraft and tactical aviation and by coastal surface-to-air missile sites.

Once the troops and equipment have been loaded into landing ships and craft, the latter proceed by groups, with escort ships under cover of fighter aircraft, to zones for forming up the landing elements (DESO). The number of these zones depends on the makeup of the assault landing force and its echelonment. As a rule, each assault element includes landing ships and transports with similar speeds of advance.

Finally, the DESOs proceed to a zone where the Amphibious Force (ADS) is formed up, which could be 150-200 miles offshore. Depending on conditions in this area, search and destruction of mines and submarines would be conducted up until arrival of the amphibious elements.

The rehearsal landing takes place at the outset or during the ADS' transit to the landing site. Its objective is to verify force readiness for the upcoming operation and to work out problems of mutual support and control.

The rehearsal must, to the maximum degree, correspond to actual landing operation conditions, especially in regard to its concept, time of day, probable enemy air opposition and geographic conditions. As a rule, during the course of the rehearsal they work through all the force's basic landing operational phases, or just certain separate, more important elements. The results of the exercise can serve to modify the general or specific plans for the assault operation.

The assault force's transit, depending on the situation and military and geographic conditions in the area of combat operations, can be conducted either in a cruising formation or independently. The force cruising formation takes into consideration first of all the provision for antisubmarine and air defense. The DESO's and their defensive group's cruising order takes into account the requirements of anti-nuclear defense.

ASW defense is provided by close escort ships (destroyers and frigates), nuclear submarines and KPUGs moving along the enemy attack submarine threat axis, as well as by ASW carrier and shorebased patrol aircraft.

Air defense is provided by a carrier battle group (AUG), groups of AAW ships, the surface-to-air capabilities of the close escort units, the landing force ships, by carrier fighters and, under certain conditions, by fighters from shore bases within range.

As a rule, the AUG deploys along the air threat axis 130-150 miles from the ADS. Carrier fighters provide combat air patrol services out to 130 miles from the carrier.

In the U.S. Navy headquarters' view, certain measures must be accomplished before attempting a landing. Among these, the most basic are: gaining sea control and air superiority in the operating area; preparation of the landing area; sweeping the inner and outer ADS and fire support ships' holding and maneuver areas, as well as the channels into the landing sectors; clearing passages through anti-amphibious obstacles emplaced in the water by the enemy; and clearing away natural obstacles in the landing sectors by special underwater demolition teams; surveillance of the landing area by special intelligence raiding parties.

Preparation, or "softening up" of the landing area, as the foreign press notes, can begin 10-15 days prior to D-Day. It entails reconnaissance and delivery of timely, planned fire from aircraft and cruise missiles against ships at sea and in port, airfields, the important air defense system targets, command posts, communications links, troop concentrations, and missile and artillery units. Strikes are carried out along a broad front so as not to disclose the actual landing beach beforehand. To do this, the AUG operates up to 120 miles offshore. In individual cases, strategic aircraft are called in.

Preliminary gunfire preparation (1-5 days before D-Day), is carried out by carrier strike and marine aviation as well as gunfire support ships.

Battleships, according to foreign specialists, play an important role in the fire support to soften up the target area. Their main battery (406 mm) can actually increase the depth of action against shore target PDO elements (these guns have twice the range of the U.S. Navy's standard 127-mm guns and four times the destructive power). In one hour of fire, an American IOWA-Class battleship can shoot more than 1,000 rounds from its 9 barrels. In addition, it is noted that the ship's armor guarantees protection to its vitally important centers from practically any kind of shore artillery using conventional ammunition. In U.S. military experts' view, this main battery fire support would be closely linked to the use of TOMAHAWK (2,000- and 500-km

range) and HARPOON (120 km) cruise missiles such that together with strike aircraft, they (the missiles), at the outset, could destroy PVO and PDO capabilities and allow the battleship to close the shore sufficiently to bring its main battery to bear.

Sweeping the inner and out holding and maneuver areas of the landing ships, transports, and fire support ships, and also the channels to the landing sectors, usually begins two days before the landing. Fighters cover the minesweeping force's operations.

Special underwater demolition and intelligence-diversion teams are delivered to the anticipated assault landing area 3-4 days prior to commencement of the assault. They destroy PDO obstacles, prepare the landing beaches to receive the assault force, set up helicopter landing pads, conduct reconnaissance of enemy anti-landing defenses, destroy command posts, communications links and other important targets so as to disrupt enemy command and control.

To enhance security, a portion of these softening up measures are taken only immediately before the landing or while it is in progress.

Foreign military specialists believe that a marine division can land over a 40-km wide beach; an expeditionary brigade, up to 10-12 km; and an expeditionary battalion up to 2 km.

THE ASSAULT LANDING--the most important phase in an amphibious operation, includes the following:

- deployment of the amphibious assault force and its escort groups;
- air and artillery preparation of the landing area;
- landing the assault subunits and their consolidation ashore;
- transfer of troops and assault equipment from amphibious ships and transports to landing craft;
- unloading supplies of logistic items;
- landing of the 2nd and follow-on echelons of the assault landing force;
- execution of combat missions on the beach.

In NATO military specialists' view, an amphibious assault might also include landing demonstration troops. This is conducted to confuse the enemy concerning the actual time and place of the landing of the primary force. Operations of the force in both a naval and airborne assault landing are shown in Figure 2.

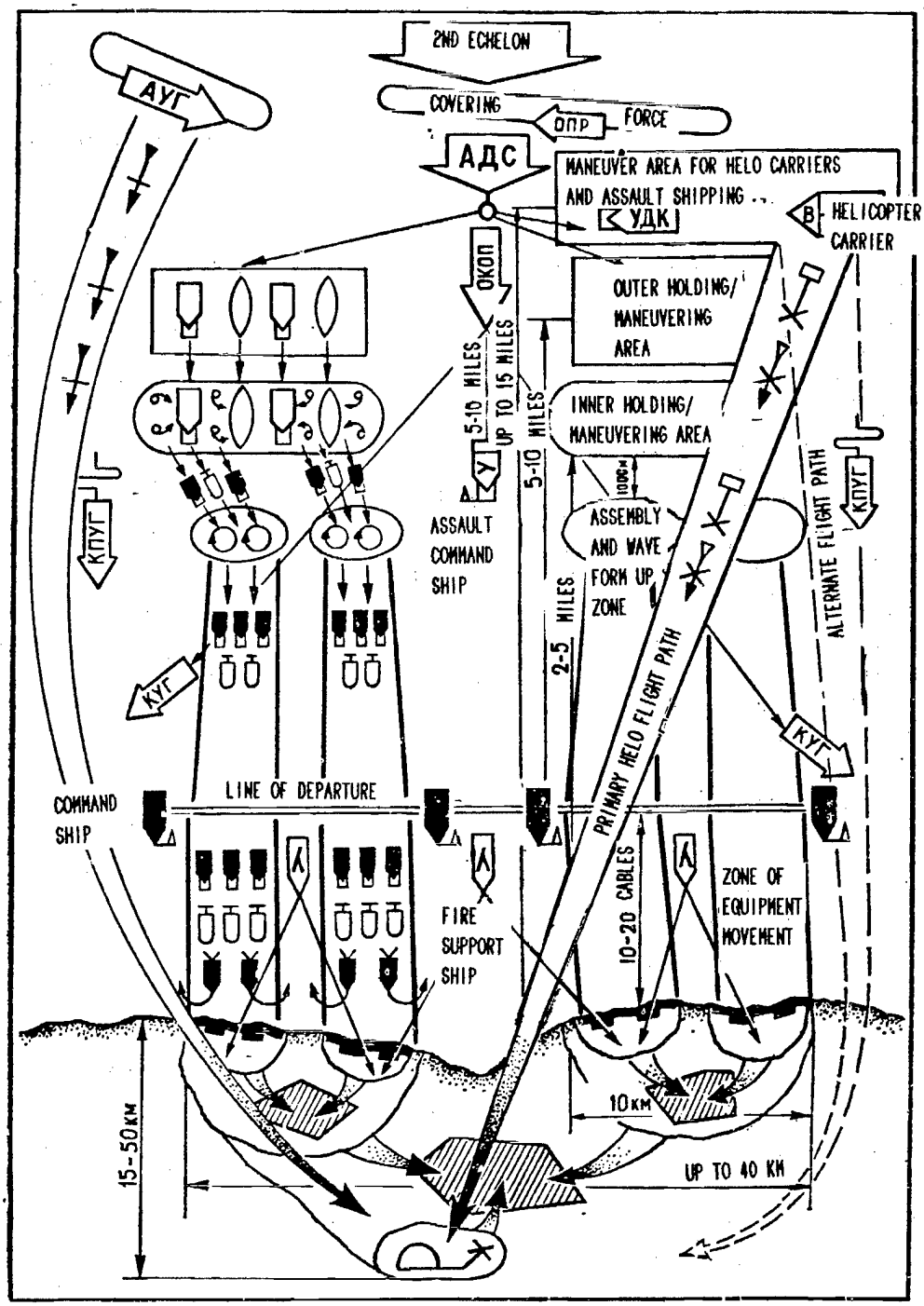

Рис. 2. Действия сил при высадке морского и воздушного десантов (вариант)

During the deployment phase, landing ships and transports of the lead assault elements marshall in outer holding and maneuvering areas 5-10 miles offshore. For their protection, covering forces, which include several surface hunter-killer groups and surface action groups are deployed on the flanks and seaward of these areas. Assault helicopter carriers and general purpose landing ships occupy areas 15 miles from the shore.

Fire support ships operate in zones, at a distance from the shoreline which roughly corresponds to the effective range of shipboard gunfire (5-10 miles).

Prior to assault commencement, the landing ships and transports transit from the outer to inner zones, as a rule, 2-5 miles offshore.

Disembarkation from the ships and transports can be accomplished in three ways: ship-shore, shore-shore, and a combination. The first method anticipates landing with the aid of landing craft, amphibious armored personnel carriers and transport helicopters. Thus, past exercise experience shows that up to 2/3 of the troops are landed by seaborne means and 1/3 by helicopters. With the availability of a significant number of troop transport helicopters on the amphibious force's ships, the ratio of troops landed on the shore by helicopter could be increased.

The shore-shore method involves the landing ships approaching the beach directly and discharging troops and cargo. Combined means signifies a joining of both methods.

While in the inner holding and maneuver zones, the landing craft and amphibious armored personnel carriers are lowered into the water and proceed to waiting areas, located in the immediate proximity to their landing ships (DK) or transports (TR). The craft with assault landing equipment (DVS), are arranged in waves each of which maneuvers slowly in a circle, ("holding orbits"), awaiting the signal to approach the DK (or TR) to onload assault landing subunits.

After they have loaded the assault landing force, they proceed to an assembly area where they are formed up into waves (Fig. 3) of amphibious assualt elements. Simultaneously, personnel-carrying landing craft, with equipment and troop subunits, which have left the well decks of the general-purpose amphibious ships arrive. In this zone they form up "planned" waves and "on-call" waves.

"Planned" waves begin, on signal, to move to the line of departure which is located, as a general rule, beyond the effective range of enemy small caliber artillery and mortar fire--a distance of 10-20 cablelengths [1 cablelength = 200 yds] from the beach. Control ships (craft) which regulate the waves' movement toward the beach are stationed at the line. Movement is in line abreast formation with assault elements separated by about 50-100 meters, which rules out the possibility of more than one craft (or armored transport) being disabled by a single missile (bomb) explosion. Movement of the first waves is conducted such that they approach all sectors of the landing beach simultaneously.

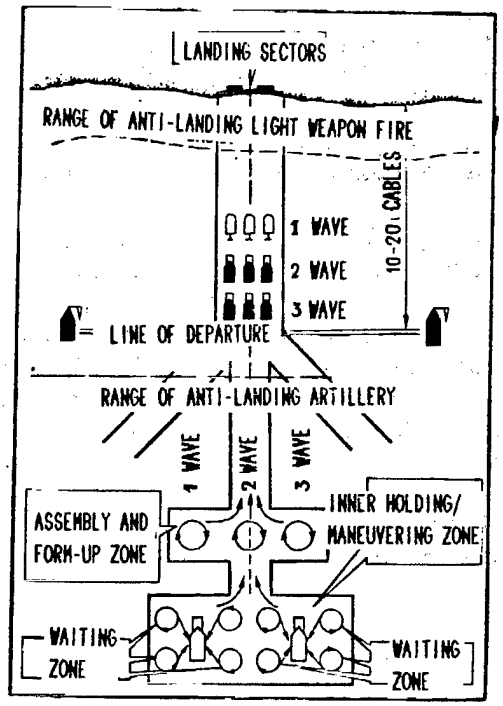

Figure 3. Sequence of Action of Landing Elements in an Assault

Aircraft, helicopters and fire support ships carry out final gunfire preparation. It begins as landing craft and transports assemble in the outer holding/maneuver zones and is aimed at neutralizing enemy PDO targets, surviving forces and equipment in order to ensure a successful assault landing and mission accomplishment.

As the first waves arrive at the line of departure, ships' gunfire and air strikes are carried out deep into enemy defenses--close support fire commences, which continues until the mission of the assault landing on the beach has been accomplished.

The "planned" waves, along with assault companies, are the first to arrive. They deploy in battle formation and develop the offensive in order to seize landing sites to allow entry of follow-on landing subunits which are landed as "on-call" waves, on order from the beach.

The naval landing is complemented simultaneously by a heliborne assualt landing (15-60 km behind the enemy or directly on the naval landing beaches to seize them or to reinforce the assault companies already in place). Each assault helicopter is assigned primary and alternate landing zones and flight routes.
After the troop transport and fire support helicopters lift off, they move to the assembly and formup zones which are located up to 10 cablelengths from the helicopter carriers. On command from the central command post, the waves begin to move along designated flight routes to the airborne landing zones. There are designated control points on the routes above which can be located airborne command posts. The time interval between helicopter waves should be 10-15 minutes. Flights into the landing zone are conducted usually along a single flight path at altitudes under 500 m. Outbound flights, for wounded evacuation, operate above 500 m.

As in the seaborne landing, the heliborne assault is in "planned" and "on call" waves. The first waves, besides assault subunits, offload engineer and reconnaissance subunits, communications and helicopter air control teams. Western military specialists estimate that up to 200 helicopter sorties are needed to land a battalion-size assault group, with its equipment and supplies.

When the landing of these assault teams is concluded, they begin offloading materiel and equipment onto the beach. Landing craft, helicopters and tank landing ships are used for this.

After the marines have seized the designated area and can defend it in strength, formations (units) of ground forces with equipment and supplies are landed on the enemy coast. In concert with the marines, they press home the attack deep into enemy defenses to destroy it and achieve the landing operation's objectives.

NATO exercise experience shows that a landing of an expeditionary battalion on an undefended shore takes 4 hours, a brigade (regimental landing team) 24 hours, a division, including offloading a 10-day supply of equipment, up to 5 days.

Foreign military specialists indicate, in connection with increasing modern defense strength, particularly in regard to the increase in effective range of ships' gunfire, transports and landing craft of the ADS, that their combat stability is sharply reduced while in the holding/maneuver zones at 5-10 miles offshore. Therefore, it is clearly mandatory to redeploy these areas outside effective range of enemy anti-amphibious fire. However, the current availability onboard the force of water borne landing craft such as LCU, LCM and LCVP (with speeds of 9-10 kt) can significantly lower the tempo and stretch out the total length of the landing operation. Only when air cushion landing craft (LCAC) with speeds of 50 kts and CH-53E SUPER STALLION, heavy troop transport helicopters, enter the U.S. Navy's inventory will it be possible to extend the distance of the holding/maneuver zones for transports and craft out to 30 miles offshore. In addition, utilization of the LCAC, as stated in the foreign press, will allow a significant increase in the number of landing approach sectors, will allow landings to be conducted on a much

wider front and will allow a rapid build up of the groups of troops which have been landed.

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TRAINER FOR HYDROACOUSTIC ASW EQUIPMENT OPERATORS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 71-72

[Article by I. Belyaev; "Shipboard Sonar Operator Trainers"]

[Text] In recent years, U.S. Naval headquarters, obsessed with the idea of achieving superiority over the Soviet Navy, has been intensively developing hardware for antisubmarine warfare, primarily sonar, and equipping their ships with new radioelectronic devices. The complexity of the sonar systems requires that the crews' professional training be continuously improved, with longer instructional periods and simulator time, which generally have a negative impact on the combat readiness of the navy as a whole. According to senior American officials, such practical training and instruction affects 21 per cent of the crew. This situation has forced military experts to find a new way of training sonar (GAS) operators. One of these solutions involves the development of shipboard trainers for training operators at sea on standard equipment. been

Some promising shipboard training devices have been in development since the beginning of the 1970s. One firm, Raytheon, has proposed to install their DS-1200 series trainers on submarines and surface ships. They simulate noise signatures of moving targets and also the signal distortion introduced by the sea environment and by the receiving hydrophones. These training devices, when connected to the input of the standard sonar, provide a realistic target detection signal on the sonar display console without interfering with the console's normal operating mode of detecting, classifying and tracking actual targets (Fig. 1). Practical demonstrations, conducted in 1973, proved its potential to support crew training aboard ship.

The DS-1210, U.S. Navy designation, AN/BQR-T14, was the first shipboard trainer production model and is currently installed on U.S. Navy SSBNs. It is a compact piece of equipment built with state-of-the-art technology. It consists of a control and display consoles; signal generators that simulate the various components of moving target noises; two signal inverters, one of which simulates the effect of the sea environment on the signals during propagation, and the other simulates effects attributable to different types of hydrophone arrays; a module that gives own ship and target motion

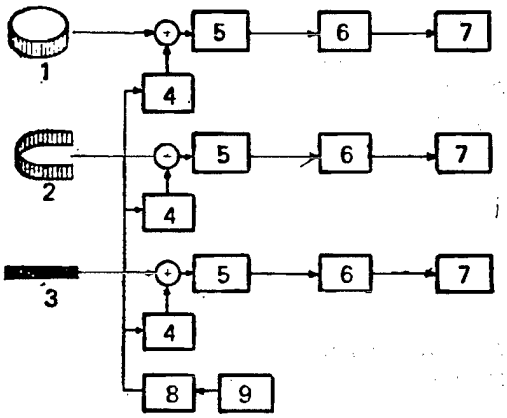

Figure 1. Flow Diagram of the Simulated Signal Path from the Training Device through the System's Receiver Circuit.

1. Cylindrical sonar array.
2. Conformal sonar array.
3. Towed sonar array.
4. Unit for inputting simulated signals from the training device into the sonar system's receiver circuit.
5. Unit for forming the characterisics of a directional sonar array.
6. Sonar processor.
7. Display unit.
8. Trainer processor.
9. Trainer control and Display console.

parameters; a memory module that holds 48 types of hydroacoustic signatures, including friendly and enemy ships, whales and heavy rain squalls; a processor that controls the trainer's functions; and a module that inputs signals into the sonar system's receiver circuit. Figure 2 shows a functional diagram of this training device.

The principal elements of the trainer appears are the signal generators that simulate various targets' hydroacoustic signals. These generators (Fig. 3) use a synthesizer to produce tonal and noise signals that are composed of discrete ship-borne machinery noises (main engines, hydraulic drives and turbogenerators), propellor cavitation noises and hydrodynamic flow noises, i.e., the characteristics by which a sonar operator is able to classify the ship type. The parameters of these components are stored in the memory module and permit the formation of signatures composed of hydroacoustic signals. Together with target and own ship motion parameters received from the processor, they are used as coefficients in an algorithym that models hydroacoustic target signals.

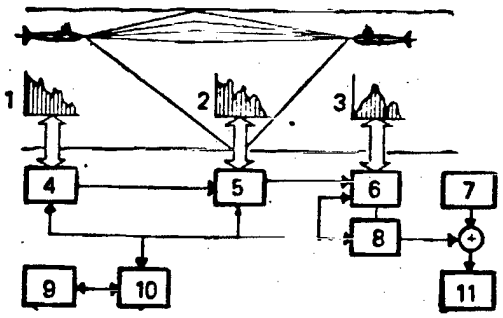

Figure 2. Trainer Functional Diagram

1. Target hydroacoustic noise pattern.
2. Hydroacoustic signal pattern distorted by propagation through water.
3. Hydroacoustic signal patern distorted by the sonar array.
4. Simulated target noise signal generator.
5. Signal inverter for simulating propagation effects.
6. Signal inverter for simulating effects of different hydrophone array types.
7. Sonar array.
8. Unit for inputting trainer signals into the sonar system's receiver circuit.
9. Trainer control and display console.
10. Trainer functional control processor.
11. Sonar system's receiver circuit.

One signal inverter makes it possible to introduce sound spreading effects by simulating ocean propagation characteristics for the different oceans. The other signal inverter, which simulates hydrophone array effects, can be programmed to operate in a variety of array configurations using spherical, conformal and towed arrays. As a whole, the AN/BQR-T4 simulator provides operator training on four types of sonar systems.

Realistic combat situations can be created during the course of crew training on the installed equipment. The trainer control panel gives the operator or instructor the capability to select different types of targets and sonar

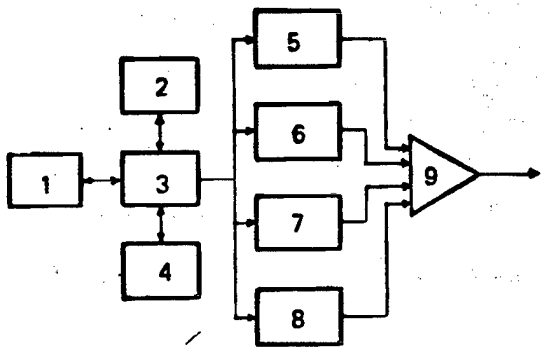

Figure 3. Target Simulation Signal Generator

1. Target motion parameter processor.
2. Memory unit for storing hydroacoustic signatures.
3. Controller/synthesizer
4. Memory unit for trainer operating mode program storage.
5. Main engine tonal noise signal generator.
6. Cavitation noise signal generator.
7. Flow noise signal generator.
8. Main engine broadband noise signal generator.
9. Summing amplifier.

conditions, change the tactical situation, control the rate of target and own ship motion, and also to supervise these changes.

Raytheon is continuing to modernize their trainers while developing the framework for model interfaces that permit them to operate together with ASW weapon fire control systems in order to provide integrated training for the entire ship's fire control tracking party.

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PAKISTAN IN PENTAGON PLANNING

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) p: 75

[Article by Col Yu. Sedov; "In the Role of a Pentagon Assistant"]

[Text] After the fall of the Shah's regime in Iran, which had been the American militarists' main support in South and Southwest Asia, the Pentagon's attention toward Pakistan sharply increased. From 1947 through 1980, the USA gave Pakistan 5.8 billion dollars in military and economic assistance, but in the period 1982-1987 alone, it will contribute 3.2 billion. According to the report of the journal MIDDLE EAST INTERNATIONAL, Zia-ul-Haq has asked for 6 billion for the next 5 years.

In the Pentagon's aggressive plans, Pakistan was prepared for the role of an outpost in the struggle against "the spread of communism's influence," in the region. It became the principal springboard of international imperialism and regional reaction for conducting the undeclared war against the people's power in Afghanistan. As the U.S. Secretary of Defense Weinberger admitted, "without a Pakistan, that has military support, the resistance (organized brigandage of counterrevolution--Yu. S.) will come to nothing." And Islamabad's openly anti-Indian course does not give rise to doubt.

In the Pentagon they believe that "in providing military support," they can give Pakistan massive amounts of weapons. In accordance with a bilateral agreement, Islamabad has already received 25 of the 40 planned nuclear-capable F-16 fighter-bombers. The latter circumstance takes on a particularly ominous meaning if one considers that, according to foreign specialists' estimate, Islamabad is working on the development of an atomic bomb. American weapons are found also in the armaments of the Pakistani ground forces and navy.

The strengthening of the regime's military machine is inseparably linked with Washington's plans for transforming the country into an "extremely important intermediate point" for the American "Rapid Deployment Force." For this purpose, the Pentagon is improving Pakistan's military infrastructure and are storing here supplies of heavy armament. According to the data of the MIDDLE EAST INTERNATIONAL, with the help of the USA, 25 airfields and being built and reconstructed in the province of Baluchistan, and 12 of these are on the Makran coast, located not far from the Persian Gulf. As is well known, this

region is the object of particular interest to Washington's militaristic circles. In the small port of Gwadar it is planned to expand the COMINT post which provides information on ships which are part of CENTCOM.

Zia-ul-Haq generates his own ambitious pretensions based on American weapons "assurance of strength." Profiting by the slogans of "Islamic solidarity," he, not without Washington's support, actively solicits the leadership in the muslim world. The bet again is being put on military power. The foreign media have written about the fact that Pakistani military advisors and even forces are in many Arab countries. According to the data in the journal EXPRESS, 20,000 Pakistani servicemen are in Saudi Arabia with the mission to guarantee the stability of the monarchist regime from any kind of upheaval capable of undermining here the influence of the imperialist circles.

Thus, Pakistan most actively plays the role of the Pentagon's assistant and will become an important link in the global hegemonistic policies of American imperialism.

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SOVIET MILITARY JOURNAL: U.S. HOMING OVERLAY ABM SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 75-76

[Article by Col V. Vasilev; "The Completion of Work in the U.S. on the HOE Program"]

[Text] According to foreign press reports, the USA has finished work on the HOE (Homing Overlay Experiment) which evaluated the possibility of destroying, by non-nuclear means, the warheads of intercontinental missiles (MBR) in the middle part of their flight trajectory (a so-called extra-atmosphere intercept).

Within the framework of this programm an experimental anti-missile missile, consisting of two sustainer stages and an internal interceptor was developed and tested. The first and second stages of the MINUTEMAN-1 were used as the sustainer stages. The interceptor, developed by Lockheed had a liquid restartable rocket motor ,an infrared target seeker, and a destructive device. During testing, the destructive device used was a structure of 36 hinged ribs with 4 small weights attached to each of them. When open, the structure's diameter is 4.5 m. The destruction device is armed on command from onboard the anti-missile missile after it has left the atmosphere.

For verifying the technical solutions for the possibility of intercept of the MBR warheads, four launches of the anti-missile missile were conducted from the launch pad at the Kwajalein (Marshall Islands in the Pacific) firing range. The warheads, which served as targets, were put in flight by a MINUTEMAN-1 from Vandenberg Airbase (state of California) at a range of about 8,000 km (the aim point was to the north of the atoll). The anti-missile missile was launched 20 minutes into the target warhead's flight (roughly 8 minutes before intercept).

It is noted in the foreign press that during the first test, which took place in February 1983, a malfunction in the system for cryogenic cooling of the GSN infrared sensor prevented successful interceptor guidance. In the second test (in May), although guidance of the interceptor to the warhead was demonstrated, a failure in the electronic circuit led to a large miss. In the

process of the third test (in December), an error in guidance appeared because of a bug in the onboard computer's software. In July 1984, over the Pacific, at an altitude of more than 200 km, the control assembly's warhead was destroyed by the interceptor in a collision with the destruction device, at an overall relative speed of more than 6 km/hr. Observations after intercept were carried out using radar, installed at the firing range at Kwajalein, a telescope located on the island of Maui (in the Pacific) and also optical instruments mounted in a special aircraft servicing the tests.

Judging by the information in the Western press, American specialists intended to use the results of the experiments which were conducted, when creating the future anti-missile missile defense for the U.S.

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WEST GERMAN UNDERWATER RESEARCH VEHICLE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 7, Jul 85 (Signed to press 9 Jul 85) pp: 77-78

[Article by Capt 2nd Rank V. Mosalev; "The Underwater Vehicle SEAHORSE-2"]

[Text] The West German firm of Bruker Mekrestekhnik has made an underwater vehicle (PA) SEA HORSE-2, designed for conducting scientific research and other types of underwater operations, investigating hydrotechnical and underwater structures, searching for objects on the sea bottom and prospecting for useful minerals.

Its characteristics are:

submerged displacement, t	50	length, m	12.5
beam, m	2.2	height, m (with bridge,	2.8 4)
pressure hull diameter, m	2.2	maximum speed, kts	
operating range, miles		surfaced	6
surfaced	300-400	submerged	6
submerged	80	cruising	5
autonomy, days	7	depth, m	
crew size	4	maximum	450
consumables, liters		operating	200
fuel	1,800		
fresh water	360		

The power plant comprises a 6-cyl, 115 kW (154 hp) diesel, connected through a clutch to an 80 kW electric motor. Surfaced, the latter is used as a generator and charges the storage battery. Submerged, being powered from the storage battery and using a hydraulic system, it turns the propellor at 320 rpm. The storage battery, with a capacity of 1,000 Ah, is made up of 398 elements. It is located in the lower part of the pressure hull and comprises about 30 per cent of the PA's weight. In addition to vertical and horizontal rudders, the vehicle has four steering devices which are driven by hydraulic power units.

The pressure hull is divided into three watertight compartments. In the bow [compartment] is a spherical light port (diameter, 1.1 m) which gives the crew a panoramic view. A lock chamber and toilet are installed in the center

[compartment]. The machinery spaces are in the stern [compartment] and designed for unattended service. A cylindrical navigation bridge is located on top of the bow compartment. Its access hatch is made in the shape of a hemispherical transparent hood which provides an all-round view when underway submerged. Control submerged is carried out from a mobile panel which can be installed directly in front of the bow light port. An emergency control panel, located in the machinery spaces, is used when the electrical and hydraulic systems are out of commission.

Equipment includes: manipulators, radar, sonar, an ultra short-wave radio set, underwater sound communications, two turnable TV cameras and an illuminating searchlight, gyro and magnetic compasses, log, a self-recording fathometer, depth gauge and other instruments. Air, needed to operate the diesel and to ventilate the compartments in stormy weather when the access hatch is battened down, is drawn in through a telescoping trunk (snorkel). It is used also to vent the diesel exhaust gases. Reserve load-carrying capacity was provided for the installation of additional equipment. The PA, also referred to in the foreign media as a "working research submarine," is adapted for handling railroad and automotive transport and can be use for military purposes.

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